THE MEAT WE EAT

THE MEAT WE EAT

by P. Thomas Ziegler

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PRINTED IN U.S.A.

THE INTERSTATE
Printers & Publishers, Inc.
Danville, Illinois

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When things do not come your way, it's a sign that you ought to be going after them.

The United States Senate (1961) by resolution (S. Con. Res. 14) recognized Samuel Wilson of Troy, New York, as the progenitor of America's national symbol of "Uncle Sam" and recognizes Arlington, Massachusetts, as the birthplace of the original "Uncle Sam." Sam Wilson, who was born in 1776 and died in 1854, supplied provisions to the United States Army troops during the War of 1812.

CONTENTS

PREFACE

A comprehensive treatment of this subject in all its ramifications would require volumes. A presentation of the basic facts concerning *the meat we eat* is the primary aim of this text. In it the author attempts to discuss rather briefly, many of the practical and scientific phases of the nation's third largest industry, and sincerely hopes that the discussion may be found helpful, useful, and interesting to the farmer, the student, and the housewife. Clarity may have been sacrificed somewhat for brevity but his experience with present day students leads him to believe that "weeded facts" rather than "cultivated words" are desired.

The author wishes to express his appreciation and gratitude to all contributors and agencies who so graciously furnished illustrations, charts, and other information, and their names may be found under acknowledgments appearing in another part of the book. It is his pleasure to make particular mention of the National Live Stock and Meat Board, Chicago, Illinois; The Agricultural Marketing Service of the United States Department of Agriculture; W. H. Tomhave, former Head of the Animal Husbandry Department of The Pennsylvania State University and the one most instrumental in giving him his basic education in meats.

Special appreciation is also expressed to F. L. Bentley, Professor of Animal Husbandry; Dr. R. C. Miller, Professor of Agricultural and Biological Chemistry; Dr. W. T. S. Thorp, Professor of Animal Pathology; Dr. J. F. Shigley, Professor of Veterinary Medicine; P. H. Margolf, Professor of Poultry Husbandry; F. P. Ferguson, Associate Professor of Agricultural Journalism, The Pennsylvania State University, University Park, Pa.; Genevra Carolyn Driscoll, M.D., Philadelphia, Pennsylvania; Miss Dorothy Bowmaster, State College, Pennsylvania.

A final word of thanks is due certain persons in the United States Department of Agriculture and friends engaged in college teaching and extension work for their suggestions and encouragement.

P. THOMAS ZIEGLER

March, 1962
University Park, Pennsylvania

CLASSIFICATION OF OUR COMMON MEAT ANIMALS

Phyla—Vertebrates *(Chordata)*
  Subphyla—*Aminota*
    Class—*Mammalia*
      Subclass—*Placentates*
        Order—*Ungulata* (hoofed animals)
          Suborder—*Artiodactyles* (even toed)
            Section—*Pecora* (true ruminants)
              Family—*Bovidae* (hollow horned)
                Genus—*Bos* (cattle)
                  Group—*Taurine*
                    Species—*B. taurus* (cattle)
                    B. indicus (humped cattle)
                Genus—*Ovis* (sheep)
                  Group—*O. Aries* (domestic)
                Genus—*Capra* (goats)
                  Group—*C. hirius*
            Section—*Suina*
              Family—*Suidae*
                Genus—*Sus*—*Sus scrofa* (wild boar)
                  Group—*S. domesticus* (swine)
          Suborder—*Perissodactyles* (uneven toed)
            Family—*Equidae*
              Genus—*Equus*
                Group—*E. caballus* (horse)
                E. asinus (ass)

SUGGESTED SUPPLEMENTARY READING MATERIALS

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Swift, L. F. and Van Vlissingen, A., *The Yankee of the Yards.* London, Eng.: A. W. Shaw Company, Ltd. 1927.

Wilson, J. A., *Modern Practice in Leather Manufacturing.* New York, N.Y.: Reinhold Publishing Corp. 1941.

Trade Journals

Journal	*Address*
Food Engineering	Chestnut and 56th Sts., Philadelphia 39, Pa.
Food Manufacture	2515 Beverly Blvd., Los Angeles, Calif.
Food Processing	Putman Publishing Company, 111 E. Delaware Place, Chicago 11, Ill.
Food Technology	510 N. Hickory St., Champaign, Ill.
Journal of Animal Science	Boyd Printing Company, Inc., 49 Sheridan Ave., Albany 10, N. Y.
Journal of Nutrition	Wistar Institute of Anatomy and Biology, 36th St., Philadelphia 4, Pa.

Journal of Food Science	510 N. Hickory St., Champaign, Ill.
The National Provisioner	15 W. Huron St., Chicago 10, Ill.
Meat	59 E. Van Buren St., Chicago 5, Ill.
Quick Frozen Foods	82 Wall St., New York 5, N. Y.

Miscellaneous

American Meat Institute Foundation (circulars and bulletins), University of Chicago, Chicago, Ill.

National Live Stock and Meat Board (literature, charts, etc.), 407 S. Dearborn St., Chicago, Ill.

Proceedings of Reciprocal Meat Conference, National Live Stock and Meat Board, Chicago, Ill.

Proceedings of Research Conference, A. M. I. F., University of Chicago, Chicago, Ill.

PART ONE

I. INTRODUCTION

Physiologists long ago assured us that we are unsuited to the hay guzzling habits of ruminants which have four stomachs to our one. It is the function of these animals (cattle, sheep and goats) to utilize grasses and grains and convert them into a more suitable and concentrated food for man as well as materials for shoes and clothing. Swine possess but one stomach and cannot utilize roughage to the same degree as ruminants but they are very efficient in converting grain into pork. These conversion abilities have made flocks and herds of prime economic importance in the development of civilization.

MAN AND MEAT

A liberal meat supply has always been associated with a happy and virile people and invariably has been the main food available to settlers of new and undeveloped territory. Statistics show that per capita meat consumption decreases with density of population. European and Asiatic nations, for example, are consuming over 100 pounds less meat per person per year than the peoples of the Americas. Inhabitants consume more of the food that is abundant in their area because it is easier to get and invariably cheaper. Argentina is primarily a cattle country and its people are the world's heaviest consumers of beef. Australia and New Zealand are the world's most densely populated sheep countries and their people consume thirteen times more lamb and mutton than do the people of the United States. The United States in turn consumes six times more pork per person than does New Zealand because the hog population in the United States is considerably larger. A well balanced agriculture provides its people with a variety of food and consequently a better balanced diet. This type of agriculture also results in a more

varied source of income as is evident by the following figures prepared by the U. S. Department of Agriculture showing where the farmer's dollar originates.

Where the Farmer's Dollar Comes From

Meat animals	32c	Food grains	7c
Dairy products	13c	Feed crops	8c
Poultry and eggs	10c	Cotton	6c
	55c	Tobacco	3c
Vegetables	5c	Misc. crops and Gov't payments	12c
Fruits and tree nuts	4c		36c
	64c		

It is noteworthy that more than half of the farmer's cash income (55 cents out of each dollar) is derived from animal agriculture.

Our Eating Habits

The peoples of the world as a whole are always hungry. Many are hungry because of a lack of food, others because of a lack of the means to buy it. Under such conditions, likes and dislikes become secondary.

Those of us who dwell in a land of plenty, blessed by the elements but developed through personal initiative under a system of free enterprise, have built for ourselves a rather selective standard of living. We are what we make ourselves, whether morally, spiritually, financially, or physically. These are voluntary acquirements; not decreed.

Broadly speaking, our eating habits are governed in a large measure by spendable income, concern for our personal well-being, and the doctor. Statistics show that thirty per cent of the family food dollar goes for meat purchases. This will vary with income. Income also governs the consumer's selection of meat cuts. The old expression, "no money, no meat," still holds. Beans are still the "poor man's meat." In the Orient it is the soya bean. In most cases, those in the middle income group are the heavy meat and potato consumers, particularly if their occupations require considerable physical exertion. Youth tops the hamburger, hot dog, and pop consuming group. Fortunately, they are also heavy milk and ice cream consumers.

Too few of us fail to realize until too late that appetite is a poor governor for the operation of the intricate human engine. Opening the food throttle can result in many ailments and discomforts. Obesity and heart failure are blood relatives. The old saw that everybody loves a fat man is a hoax. Physical well-being can mean different things to different people.

Some of us are food faddists; we make food a religion. Others follow trends such as the order of the Slim Look or the Olympian. Then we have the Society of Suffering Distaffs who, by diet tricks or pills, take off ten pounds in twenty days and recover it in ten. They are the Lost and Found. Let's be sensible and make *well-being* and *being well* a little more congruent.

Finally, our food habits may be dictated. As babies we had no choice, no teeth, no cavities. In old age and sometimes before, it is doctor's orders and store teeth. Our intense desire to enjoy "living it up" to the exclusion of its after-effects brings too many of us to an end which we did not want to foresee.

The Present Trend

The overall trend of the consumer has been for leaner meats. This was given added impetus by the discovery that the cholesterol level in the human circulatory system may be raised by the ingestion of certain fats. Cholesterol is found as fat in the human blood stream and may be deposited on the inside walls of arteries and veins, thereby hindering the free movement of blood to and from the heart.

One of the largest and most outstanding institutions devoted to ferreting out the roles of fat and cholesterol in heart disease is the Hormel Institute at Austin, Minnesota. It is a unit of the Graduate School of the University of Minnesota. Their findings evidence the fact that saturated animal fats are no greater contributors to cholesterol formation than unsaturated vegetable fats. Since the human body itself manufactures cholesterol, scientists must learn more about the metabolism of fats and their role in nutrition and of their harm, if any, in atherosclerosis.

The consumer demand for leaner meat has made certain demands on the producer, packer, and retailer. The producer must select and breed for meat quality animals that are more heavily fleshed and that will reach a market weight at an earlier age without the extended fattening period. It will require progeny testing to find the strains that produce more tender meats.

The packer must compensate these efforts by paying a premium for animals of superior meat type and quality and in the meantime do some fat trimming on the overdone carcasses and cuts. The retailer should in turn give the matter of trim further consideration.

What the public should learn to accept is the fact that fat and marbling are still marks of quality but not necessarily of tenderness, and that fat aids in giving aroma and flavor to meat and makes it juicy. If the consumer avoids fat because of a fear of overweight, the following test may be of interest. It was performed by the nutrition specialist of one of the large household equipment companies some years ago to get some idea of the effect of animal fats in the diet of their office force. To their surprise it showed that increasing the fat content of the meat in their diet resulted in an increased consumption of meat because it tasted better, with the result that they cut down on their total intake of other items. The diet had an appreciable effect on the work output and general alertness of the force and resulted in weight loss in a majority of instances and more efficient work. Similarly some of the underweight employees gained in vigor and weight.

There should be no doubt in our minds that eating in moderation of those foods that furnish us a balanced diet is the answer to most of our overweight ills and that does not mean the exclusion of animal fats.

Although the author confesses to being a moderately heavy meat eater, it is not to be concluded from what is to follow that meat is "something with wings." A mixed diet that includes sufficient leafy vegetables, a liberal amount of raw vegetables, fresh fruit, milk, a savory serving of one of over a hundred possible tasty meat dishes, and as little of those complicated sweets that end up a meal as possible, is the sensible one. But even a sensible meal can be made destructive by over-eating. Overwork and over-distension of the digestive tract can be likened to an over-inflated tire run at high speed—it may result in a blowout. A quotation from *Exchange* is worth repeating at this point: "Some business men make more of a feature of their eating than of their business. Their business is merely an interval between meals. These men who hate to let business interfere with eating usually come to the day when their eating puts them out of business."

What the Average American Eats Annually

	Lbs.
Meats	
Beef	85.7
Pork	65.3
Veal	5.7
Lamb and mutton	4.5
Fish	10.7
Poultry	
Chickens (dressed	28.8
Turkey (dressed)	7.0
Eggs (dozens)	28.0
Fats	
Lard	8.0
Margarine	9.5
Other	11.5
Dairy Products	
Fluid milk and cream (quarts)	170.5
Butter	8.0
Cheese	8.0
Ice Cream	18.7
Cereals (Breakfast)	
Wheat	2.7
Corn	1.8
Oats	3.0
Rice	1.0

	Lbs.
Fruits	
Fresh	
Apples	22.2
Citrus	33.9
Other	46.3
Canned	22.0
Dried	3.3
Juices	11.2
Frozen (incl. juices)	8.8
Beverages	
Coffee	16.0
Tea	.6
Cocoa	4.0
Vegetables	
Fresh	125.3
Potatoes	101.0
Sweet Potatoes	6.0
Canned	44.7
Dry Beans	7.5
Dry Field Peas	.4
Sugar	97.8
Frozen	10.0

A Natural Food

Lean meat is primarily protein in nature. The lean and fat tissues are very similar to human body tissue and because of this, they are highly digestible and can be easily and rapidly assimilated by the human digestive tract. Milk is the only other food of economic importance that can outstrip meat in this respect. A chemical analysis may show that a food is rich in certain food elements but these elements may not be very digestible, or the body may not be able to absorb and utilize them as efficiently as it would the same elements in another food. This is known as the biological value of a food nutrient.

Meat proteins have a high biological value, followed closely by animal fats. Some products made from soybeans have been

reported to be high in this respect. The concentrated nature of meat with its low fiber content and its ability to be readily and almost wholly absorbed, leaving but little residue in the intestines, makes it a number one food for man.

A Virile and Protective Food

Experience is a great teacher. It has taught the soldier, the laborer, and the trainer of athletes that meat has something beside "fill-in value." Before scientists revealed its rather broad vitamin content and the high biological value of its proteins and fats, its merits were expounded by the expression, "it sticks to the ribs." The body requirement for certain amino acids, of which at least ten are considered essential to life, are all found in meat. Its proteins have, by individual analyses for the amino acids, been found to be biologically complete.

The human requirements for energy secured through the medium of carbohydrates and fat can be supplied in large measure by the fat in meat since fat has 2.25 times the energy value of carbohydrates.

With the exception of calcium, meat contains all the necessary minerals for human body metabolism. Add to this list of nutritive elements the daily discoveries, through extensive research, that meat is also rich in many of the vitamins so necessary to a normal, healthy body, and the completeness of meat as a food is rather evident. The meat diet of the hardy Eskimo attests to this fact.

Some Interesting Figures

Peoples of	Meat Consumption	Height	Wt.	Life Expectancy
India	less than 20 lbs.	5′3½″	110 lbs.	27 yrs.
China	less than 20 lbs.	5′3½″	120 lbs.	30 yrs.
U. S.	161 lbs.	5′7½″	154 lbs.	69 yrs.

A Palatable Food

Brushing aside for the moment all that has been said, and forgetting high-sounding names, over-zealous scientists, and doctor's admonitions, let us revert to plain hungry mortals seated behind the festive board. Instinctively we look for the platter of meat which to most of us is not only the king but the whole royal family of appetite appeal. It transcends all other foods in aroma, causing a watering of the mouth and a conscious glow in

the most bulbous organ of the gastro-intestinal tract. It is a psychological stimulus that causes a flow of saliva and gastric juice, preparing the food chamber for the royal guest. And it does not beguile us; it satisfies. It accomplishes this by supplying what it advertises to our nostrils before we consume it. As

Per Capita Meat Consumption by 11 Leading Countries, 1960.

Country	Beef and Veal	Pork	Lamb, Mutton and Goat	Canned Meat	Total[1]
Argentina	135	14	17	[2]	166
Australia	119	21	87	7	234
Canada	72	58	3	5	138
Denmark	53	91	1	[2]	147 [3]
France	60	53	6	[2]	124
Germany, West	42	67	1	[2]	111
New Zealand	99	34	89	[2]	222
Paraguay	134			[2]	134
Uruguay	181	17	36	[2]	234
United Kingdom[4]	47	44	26	14	131
United States	91	65	5	[2]	161

[1]Beef, veal, lamb mutton, goat meat and pork (excluding lard)
[2]Included with other types
[3]Includes horsemeat
[4]The United Kingdom is the largest meat importer in the world Approximately 49% of the meat consumed in the world excluding Communist China, is beef and veal 42% is pork and 8 5% is lamb, mutton and goat. Less than one-half of 1% is horsemeat.

Total Meat Consumption Per Capita in Some Nations With Low Consumption, 1960.

	Pounds		Pounds		Pounds
Yugoslavia	46	Brazil	45	Cuba	85
Portugal	44	Chile	54	Switzerland	96
Greece	40	Italy	42	Ireland	99
Spain	36	Finland	63	Belgium	99
Philippines	22	Norway	77	Union of So Africa	73
Japan	9	Mexico	40	Netherlands	90

we crunch its juicy fibers between permanent or removable ivories, we receive our first pleasant realization of a previous longing sensation. As we swallow the tasty mass, we begin to radiate satisfaction in our eyes, in our speech, and in our actions. We become more amiable, more clear-minded, and more reasonable—certainly a most honorable tribute to any food product.

II.

PREPARATIONS FOR SLAUGHTERING

The practice of raising, slaughtering, and processing the farm pork supply has been more or less traditional in rural America. Whether it will gain in popularity, particularly in respect to the addition of other types of meat animals that could be included in the farm larder, will depend in large part upon the education and training of the farm youth and the trend in their mode of living as it may be affected by changing world conditions.

A producer of meat, who is also a processor and consumer of his own product, operates at a decided advantage over a non-producer because he eliminates the middle man and thus increases his operating margin. The profitable production of the live animal is however only a part of the operation of securing the farm meat supply. Without the proper equipment or the knowledge and ability to slaughter and process the animals, the venture might be a costly one. Fortunately most communities have experienced butchers available to do custom butchering. But it is the farm youth who must be encouraged to gain this experience by actually doing the work and not by simply being handy men or on-lookers.

The Animals to Be Slaughtered

In normal times and more particularly in times of national emergency, the man of the soil, regardless of the acreage he controls, would act wisely if he made himself independent of the world market in so far as his own table is concerned. To do this would require the preservation and storage of a larger variety and a greater poundage of meat than heretofore. Today, the unit freezers for household use and the freezer locker plants have made this possible. It is no longer necessary to cure and can the entire meat supply.

The average American eats about one-half pound of meat

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per day. On this basis a family of six would require the following for their yearly meat supply, exclusive of fowl and fish:

Animal	Live Wt.	Dressed Wt.	
1 veal	150 lbs.	90 lbs.	
1 beef	1000 lbs.	580 lbs.	
2 lambs	180 lbs.	90 lbs.	
3 hogs	690 lbs.	405 lbs.	100 lbs. lard

The value of the pelts, hide, calf skin, livers, hearts, tongues, and offal fat amply rewards the farmer for the labor in slaughtering.

High quality meats can be produced only from quality stock that has been fattened on grain or grass or both. Heifers, cows, and young bulls of the dairy breeds are available on most farms and make satisfactory meat when fattened. All animals to be slaughtered should be in thrifty condition and gaining in weight. They should not become excited or overheated at the time of slaughter because such a condition does not permit the animal to bleed out freely and may result in a pink or fiery condition of the carcass. Such carcasses have inferior keeping qualities.

Animals should have free access to water but feed should be withheld at least 24 hours previous to slaughter. This permits the digestive organs to empty themselves somewhat and facilitates evisceration. Care should be taken in handling the animals in order to avoid bruises caused by the use of whips, canes, or sharp instruments of persuasion or by loose boards or projecting nails. Over-crowding and the presence of horns on cattle may cause serious losses. Animals in the advanced stages of pregnancy should not be slaughtered because the blood is rather highly charged with toxins incident to fetal waste material.

Equipment

Most farms possess buildings for every purpose except slaughtering. This is quite natural since it would not be used enough to be essential as a unit in itself. The farm slaughter usually takes place out of doors where conditions are generally uncomfortable and inconvenient. This condition can be overcome by making the two-car garage into a temporary slaughter house for several days. If such a building is not available, the conversion of an old building or the construction of a new one that would serve the dual purpose might be advisable. It should

be fireproof in construction, using either hollow tile or concrete blocks for the walls and concrete for the floor with at least a 4-inch drain in the center. A building 20′ x 20′ x 12′ with a gable roof would be a serviceable size. The 12-foot ceiling provides head room for hoisting the beef. A small 6 x 8 foot addi-

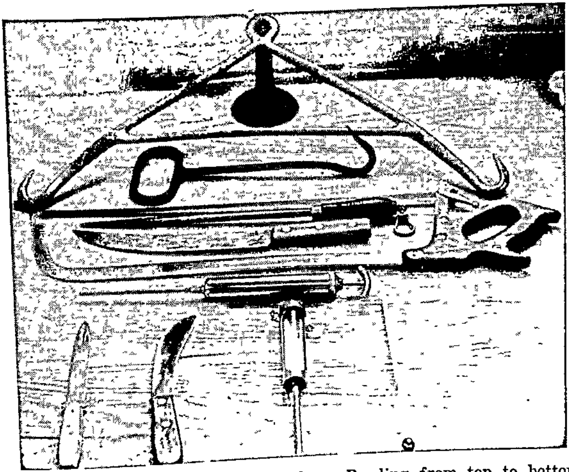

Fig. 2.1—Tools useful in farm slaughter. Reading from top to bottom: bell type hog scraper, iron hog and calf gambrel, hog hook, meat saw, steel, steak knife, pickle pump. Bottom, reading from left to right: sticking knife, 6-inch skinning knife, hot water thermometer, salimeter (used to test the strength of curing pickle).

tion at the rear, to house a hot water tank and pup stove and a rendering kettle that is equipped with an enclosed fire-box, would complete the building. The smoke house should be made a separate unit from the combination garage and slaughter house.

The equipment needed consists mainly of small items, many of which can be stored away in a cupboard when not in use. The larger pieces of working equipment include such articles as a windlass hoist of one ton capacity fastened to the sidewall, a scalding vat or a barrel, a hog scraping table, a cutting table, a skinning rack and a lard press. The skinning rack, which is a device used to hold an animal on its back, is made by taking two

pieces of 2 x 4 lumber 6 feet long and fastening them in parallel about 11 inches apart. A scalding vat can be made of tongued and grooved 1½-inch cypress plank and should be 3 feet wide, 5 feet long, and 2 feet deep, with one end sloping toward the bottom. A hog scraping table 3 x 5 feet and 24 inches high can be made from rough lumber.

Other necessary equipment consists of a stunning instrument; *hog and calf gambrels*; a *beef tree*; a *beef splitting saw* or a large cleaver; a meat saw; a small cleaver; skinning, boning, and steak knives; a *sticking knife*; *hog scrapers*; a hot water thermometer; an oil or water hone; a steel; a scale; lard containers; *scrapple pans*; a *meat grinder*; a *salimeter*; a *pickle pump*; curing barrels; a sausage stuffer or stuffer attachment; a *smoke house*; and *refrigeration* (*natural* or *artificial*.)

THE CARE AND SHARPENING OF KNIVES

A dull knife is inefficient and ineffective except for cutting oneself. Those of us who marvel at the speed and dexterity of the men working in the slaughter rooms of large or small packing houses must remember that these men work with sharp tools and must be expert to hold their jobs.

Grinding

The manufacturers of knives usually do not market them sharpened for immediate use. Although many knives do not need further grinding on a coarse stone, all of them need honing. When it is necessary to grind a knife to get extra thinness to the cutting edge before honing, either a sand stone or an emery stone may be used. In either case the stone should be water or oil cooled to avoid heating the knife.

The blade need not be ground back more than ¼ of an inch from the edge, forming what is termed a bevel. This bevel should be the same on both sides of a skinning knife so the operator may use it with either hand in siding (removing the hide from the side of a carcass.) If the bevel is only on one side of the knife, the bevel side must be next to the hide when skinning. It is advisable to grind the knife either by running the stone *at a right angle against the edge, or with the edge of the knife.* By using the latter method, one is less likely to scar the blade *any further back than the actual bevel itself, and since the* smooth finish of a knife is less likely to rust than the ground

surface, this is rather important in maintaining the neat appearance of the blade. A sand stone of medium fine grade is preferable to an emery stone for grinding knives.

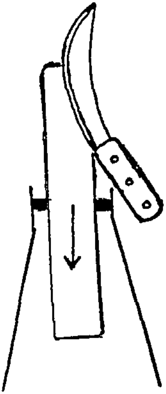

Fig. 2.2—Grinding.

Honing

Honing is done either on a water or a fine carborundum stone on which water or oil is used to maintain a scum-free abrasive surface. The stone should be set in a block of wood or else placed on a damp cloth to keep it from sliding.

The operator grasps the handle of the knife with his right hand, takes a position slightly to the left of the stone and places the heel of the knife blade on the end of the stone nearest to him. The blade of the knife should be tilted up enough to make the bevel lie flat with the stone. The finger tips of the left hand are placed on the flat of the blade near the back edge to exert pressure on the blade. With a sweeping motion toward the right of the stone, the knife is drawn completely across and inward against the cutting edge of the blade.

The knife is then turned over in the palm of the hand by a twist of the thumb and index finger and drawn across the stone toward the operator. Honing against the edge of the knife avoids the formation of a wire edge. To finish the sharpening process, steel the knife and test it for sharpness and smoothness of edge

the backward stroke in addition to the downward stroke. About a dozen strokes of the knife should be sufficient to put an edge on a knife that is not very dull.

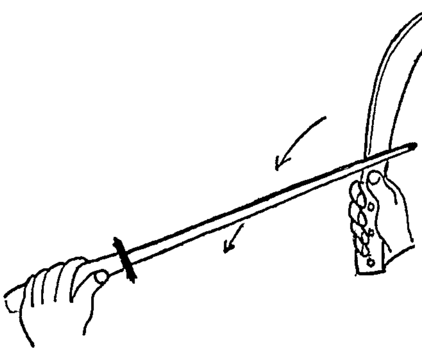

Fig. 2.4—Steeling a knife.

Knife Racks and Pouches

Various types of racks can be made from wood or cardboard in which knives may be placed to protect the cutting edges. A very simple and inexpensive knife rack can be made by sawing slits in a cardboard roll that comes on the inside of all rolls of wrapping paper and fastening it inside the drawer of the cutting table.

A knife that is greasy should be cleaned in hot water and dried thoroughly. A light application of lubricating oil or tallow that is free from salt will keep it from rusting when not in active service.

A knife pouch and belt to be worn when slaughtering can be made from a cow hide tanned in the laboratory or purchased from a dealer. The necessary equipment for making the pouch consists of a riveting machine (hand riveter), rivets, leather punch, belt buckle, harness snaps, and a knife.

Cut out a back piece, 7 inches wide at the top and 8 inches long. It may be cut square or oval at the bottom. Cut a similar piece but make it 1 inch shorter for the outside part of the pouch. Now cut a narrow (½-inch) piece of the thickest leather for an inset to be placed between the back and front pieces where they are riveted together around the edge. This constitutes the

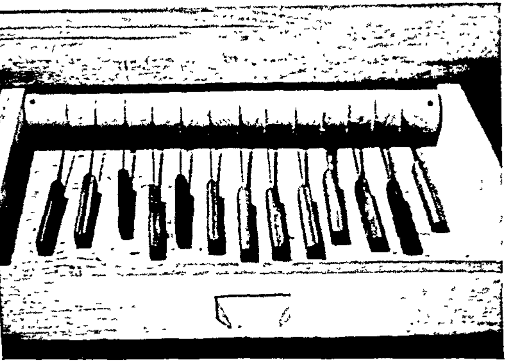

Fig. 2.5—A knife rack made from a cardboard roll.

pouch. Cut two straps ½ inch wide and 4 inches long and rivet them to the top of the back piece of the pouch and then rivet these to the belt, made from a strip of leather 1 inch wide and 40 inches long. The position of the pouch should be about 6 inches from the buckle or so it will hang in front of the right thigh. The metal buckle is riveted to the belt.

If desired, a narrow strap with a light harness snap riveted to one end may be riveted to the left side of the belt to carry a steel.

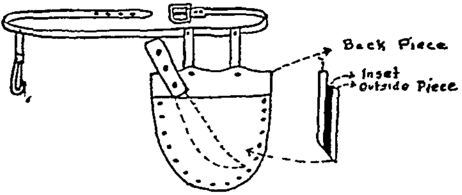

Fig. 2.6—A knife pouch

Cleaning and Storing Knives

A sharp knife is a must for rapid and efficient work. The right type of knife for the particular job is also very important. Large meat packers use some 35 different types of knives and buy about $15,000 worth a year. The excessive use of a grinder should be avoided.

It is better to clean a knife in hot water than to clean it with steam since excessive heat tends to damage a wooden handle by loosening it from the tang. Most of the knives that contain good steel are not affected by ordinary steam. If they are subjected to steam under pressure, then the high temperature would spoil the steel's ability to hold an edge. The steel in saw blades is harder than knife steel, and steam cleaning is preferable. This is also the case when cleaning large power driven knives.

Knives should be kept clean and dry. Water or dampness causes rust, and rust eats deep. Store all surplus knives in a dry place.

III.

FEDERAL AND STATE MEAT INSPECTION

MEAT INSPECTION

The Meat Inspection Service of the United State Department of Agriculture was inaugurated and is maintained by the Meat Inspection Act of June 30, 1906.[1]

The agency accountable for the operation of this act is the Meat Inspection Division of the Agricultural Research Service of the United States Department of Agriculture.

The Purpose of the Act

Its purposes are: to safeguard the public by eliminating diseased or otherwise bad meat from the food supply, to enforce the sanitary preparation of meat and meat products, to guard against the use of harmful ingredients, and to prevent the use of false or misleading names or statements on labels.

Parties Responsible to the Act

The act applies only to those establishments which slaughter, pack, render, and prepare meats and meat products for interstate shipment or foreign commerce. Any operator or establishment desiring the inspection service must submit triplicate copies of plans and specifications of the plant in which inspection is to be done at the time the application is filed. When all the requirements of structural arrangement and sanitation comply with the requirements of the act, the establishment is granted

[1]This act is a law that makes it a crime, punishable by a fine of $10,000 and two years in prison, to transport or offer for transportation in interstate or foreign commerce any meat or meat product which has not been inspected and passed by a Federal inspector, or to violate any provisions of the Act.

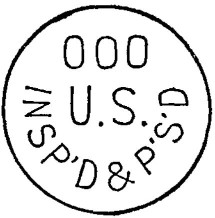

Fig. 3.1—Inspection Brand

an official number which will appear on the inspection stamp and identifies the product wherever found. The position of the ciphers in the illustration occupy the space reserved for the official number of the establishment. These official numbers appear in the directory of the Agricultural Research Service which can be secured from the U.S.D.A.

The Meat Inspector

The personnel of the meat inspection service numbers approximately 3,000 persons, divided into two classes: (1) professional or veterinary inspectors who are graduates of accredited veterinary colleges and have passed the required civil service examinations, and (2) non-professional or lay inspectors who are required to pass a civil service examination and are designated as grade 1 and grade 2.

Lay inspectors, grade 1, are required to have had at least three years' experience in handling meat animals; lay inspectors, grade 2, must be experienced and well informed in packing house operations, as their duties consist in the supervision of the curing, preparation, and marketing of meats and meat products. The lay inspectors are under veterinary direction.[2]

Ante-mortem Inspection

In the ante-mortem (before death) inspection, the animals are observed in the pens or as they move from the scales after weighing to detect evidence of disease or any abnormal condition that would indicate a disease. If an animal is suspected, a metal tag is placed in its ear bearing the notation U. S. Suspect No. ---- and the record of the tag number, the inspector's diagnosis, and the animal's temperature (if ascertained) is made and sent to the inspector who is to conduct the post-mortem examination. Animals found dead or dying or showing symptoms of rabies, tetanus, milk fever, or septicemia, or condemned in the ante-mortem examination.

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[2]All inspectors are employees of the Meat Inspection Division, and work and receive their pay from the United States Government. In no case are federal inspectors paid by packers.

Post-mortem Inspection

The post-mortem (after death) examination is made at the time of slaughter and includes a careful examination of the carcass and the viscera (internal organs). Certain diseases and certain stages of a disease make meat unsafe for human consumption but this does not mean that certain diseased parts, distinctly localized, would make the entire carcass unfit for food. Therefore, in the case of lesions confined to a particular organ in which nature has erected an encapsulating tissue, making the diseased portion a distinct and separate part of the body, the surrounding meat is perfectly healthy for food.

In the case of cattle which have reacted to the tuberculin test, the law requires that reactors be slaughtered at designated abattoirs where the animals are inspected by state or federal veterinarians. Carcasses that show no tubercular lesions or infected lymph glands are passed while those parts which are affected are condemned. The meat inspection service, both federal and state, is the guarantee to the supporting tax payer that his meat is wholesome.

Cost of Inspection

The number of animals inspected (between 100 and 110 million annually) divided into the total expenses of the Meat Inspection Division (21⅓ million dollars) makes an average cost of 20 cents per animal or about one-fourteenth of a cent per pound. Each person consumes an average of 161 pounds of meat in a year, of which about two-thirds is federally inspected, making the total cost of the service about 12 cents per person per year.

Inspection Cost Shift

The U. S. Department of Agriculture appropriation bill with a provision to pass along the cost of federal inspection to packers and processors became effective as of July 1, 1947. Federally inspected plants were required to pay for the service on the basis of a set charge of $89.60 per inspector-week with the Meat Inspection Division *designating the number of inspectors required for* the conduct of efficient inspection. Inspected plants were required to post a payment bond equivalent to ten times the total weekly fee which they were to be charged. The per-man-hour overtime charge (Monday through Friday) was $2.58 and $1.64 for holidays, these to be in addition to the payment of the set charge.

This shift of the cost of meat inspection from the government to the packer was in effect until the passage of the Kem bill (S2256), when the cost of meat inspection reverted again to the United States government, effective July 1, 1948. The meat-packing industry now reimburses the government for overtime service only.

Disposal of Condemned Material

Condemned animals, carcasses, and other material are destroyed by rendering them in separate steam pressure tanks, sealed and under the custody of an inspector. The pressure cooking and denaturing process destroys all disease germs and the contents are made available for tankage or fertilizer. Establishments that do not have tanking facilities generally burn or denature the condemned material.

Uninspected Meats

The Federal Meat Inspection Act applies only to meats shipped inter-state or in foreign commerce.[3] The different states have varying legislation governing the slaughter, packaging, and handling of meats shipped intra-state. In many instances the local abattoirs are governed by local ordinances of the city or community in which they are located. In practically all cases, a slaughter establishment must have a state permit and is subject to state inspection for sanitation. This inspection is administered by the State Department of Agriculture. Many states furnish full or part-time veterinary inspectors for abattoirs which request their services. In some states the wages of state inspectors are paid by the state while in others the packer assumes the cost of the inspector's salary.

Application of the Act to Farmers

The 75th Congress of the United States amended the concluding paragraph of the Meat Inspection Act and therein defined a farmer as a person or partnership chiefly engaged in producing agricultural products on whose farm the number of cattle, calves, sheep, lambs, swine, or goats is in keeping with the size of the farm or with the volume or character of the agricultural products produced thereon but does not mean any person or part-

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[3]An amendment to the Meat Inspection Act made in 1943 provides for the extension of Federal Inspection to those meat slaughterers and processing plants which do an intra-state business and which can meet the requirements and regulations issued under the Act.

nership engaged in producing agricultural products who (1) engages in buying or trading in livestock; (2) who engages in a business which includes the slaughter of livestock for meat purposes; (3) who buys or sells meat or meat products other than those prepared by any farmer on a farm; (4) who actively engages in salting, curing, canning, or preparing sausage, lard, or other meat products; and (5) who slaughters or permits any person to slaughter on his or their farm, cattle, calves, sheep, lambs, swine, or goats which are not actually owned by him or them.

It states that the provisions of the act shall not apply to animals slaughtered by any farmer on the farm and sold and transported in interstate or foreign commerce, nor to retail butchers or retail dealers (both being defined in the amendment) who supply meat and meat food products to their customers and who (1) conform to the provisions of the meaning of the amendment, and who (2) do not sell diseased, unsound, unwholesome, or unhealthful meat, knowing that such meat food products are intended for human consumption. For violation of this latter provision, the person found guilty and convicted shall be punished by a fine not exceeding $1000 or by imprisonment for a period not exceeding one year or both.

ANIMAL DISEASES AND OTHER LOSS FACTORS

Anyone doing a limited amount of slaughtering, whether it be for home use or for subsequent sale, should be able to recognize unhealthy or unthrifty animals and know something about the effect of the more common ailments on the quality and value of carcasses. Whenever there is any doubt concerning the health of an animal, a veterinarian should be consulted.

Meat inspection regulations condemn the carcasses of animals suffering from the following diseases: hog cholera, rabies, black leg, pneumonia, anthrax, peritonitis, enteritis, uremia, septicemia, pleurisy, parturient paresis, tetanus, extreme emaciation, pseudotuberculosis, generalized tuberculosis, and shipping fever.

Other ailments may or may not render a carcass unfit for food, depending upon the stage of the disorder. Some of the more common are:

Lumpy Jaw

This is a chronic, non-communicable disease affecting the jaws of cattle and the udders of hogs. It is caused by a ray

fungus that is sometimes found on barley awns, oat stubble, and different grasses, and produces hard, tumor-like swellings along the sides of the jaws of cattle If the disease is localized in the head of an animal, the carcass can be used for food, but the head and tongue should be buried or burned

Tuberculosis

This communicable disease is characterized by the formation of small nodules in the internal organs and infection of the lymph nodes, particularly bronchial and mesentery When the lungs are badly affected, the animal will cough and have difficulty in breathing when exercised Tubercular animals often show no physical signs of the disease and it can be detected only by administering the tuberculin test

When nodules are found that have pus in their centers or that are calcareous in nature, a veterinarian should be called to examine the carcass Animals that have reacted to the tuberculin test should and, in most cases, must be slaughtered at a designated abattoir under state or federal inspection If the animal is in good physical condition, does not show nodules on the carcass, and has only a few organs that show visible lesions, the organs so affected are condemned and the carcass is passed as being fit for food

Bovine tuberculosis has been almost completely eradicated in the United States, brought about by the use of the tuberculin test, the slaughter of reactors, and the disinfection of the premises where found The loss on hog carcasses and parts condemned is now but five per cent of total condemnations Associated with the decline in bovine tuberculosis has been the accompanying decline in the human death rate from tuberculosis of the nonrespiratory type

Foot and Mouth Disease

This is sometimes referred to as "hoof and mouth disease" or "aphthous fever" and is a highly infectious disease caused by a virus so small that it cannot be seen by the most powerful microscope All cloven-footed animals, especially cattle, hogs, sheep, and goats are susceptible to the disease It is characterized by the formation of blisters on the mucous membranes covering the tongue, lip, cheeks, palate, and other tissues of the mouth, on the skin between and above the claws of the feet, and in the teats and udder In sheep goats, and deer, the feet are the most common

site of vesicle or blister formation. The most common agent in the spread of the disease is the infected animal itself, particularly in the early stages of the disease. Milk, meat, and the raw by-products of slaughter of infected animals may also be instrumental in distributing the virus. Man does not contract the disease but he is next in importance to infected animals and animal products as an agent for conveying the virus either mechanically, on the clothing, or on the person. The two major outbreaks of the disease in the United States occurred in 1914-15 (involving 22 states) and 1924-25 (California). The disease is rather prevalent in Argentina and Mexico and therefore importation of live animals and meats from those areas is under strict government supervision.

Since no cure or immunizing agent has been developed for the disease, two methods in use for control and eradication are: (1) the slaughter method, and (2) quarantine. The canning processes kill the virus, low or sub-freezing temperatures do not.

Tumors

Tumors are new growths that appear in different tissues of the body, some of which may be caused by an injury or some foreign body. In such a case, nature throws encapsulating tissue around the new growth to close it off from the rest of the body. Tumors that are not "malignant" and do not affect the surrounding tissue are cut out and the carcass used for food.

Condemned Livers

Due to the vascular nature of the liver, permeated throughout with numerous veins and capillaries, any organism entering the portal circulation will be carried to the liver and may cause it to become infected and abscessed. Abscessed livers are more prevalent in regions where baled hay is fed extensively, due in all probability to the pieces of wire which cause sores in the digestive tract. The germs from these sores are taken up by the blood and then to the liver. Nails or other sharp objects in the feed are equally guilty in causing sores. Any abscessed liver must be discarded as unfit for food. Livers showing numerous scars or white areas (cerosis) are not acceptable for human consumption, but make a good poultry or dog food. Some pig livers show white areas caused by one stage in the life cycle of the round worm. If only isolated scars or white areas occur without showing any abscess, these areas may be cut out and the liver used for food.

This is also true of isolated areas on lamb livers infected with nodular disease.

Of the 2,408,766 beef livers condemned under federal inspection in 1959, 54% were for abscesses; 20% for liver fluke; 13% for telangi-ectasis; and 7% for sawdust. Stated bluntly, one out of every ten livers was found to be unfit for human consumption.

Pregnancy

Animals should not be slaughtered in the advanced stages of pregnancy. The physiological condition of the female is disturbed and the flesh is not normal.

Accidental Death

A healthy animal that has been killed through accident, suffocated from bloat, or dies from a heart puncture caused by a nail or wire, is fit for food providing someone is there to cut the throat and bleed the animal. In case of a poor bleed, the meat can be soaked overnight in a weak salt solution which will draw out the remainder of the blood.

If a kerosene drench is given to an animal suffering from bloat, and the animal suffocates ten to fifteen minutes later, time and trouble can be saved by burying or tanking the animal unless the consumer relishes a kerosene taste in meat.

Cattle Grubs

Cattle grubs or warbles are responsible for the loss of millions of pounds of beef that must be trimmed from the grubby backs of the carcasses. The loss from damage due to disturbance of cattle by the fly (such as loss in weight and lowered milk production); the loss from waste in meat due to necessary trimming; and the loss in damage to hides is estimated to total around 100 million dollars per year.

The fly stage of the grub is in the spring and summer months. The flies develop, in from three to four weeks time, from grubs that fall from the backs of cattle. Within an hour or two after becoming flies, the male and female have mated and the female starts laying eggs on the hair of the legs, the underside of the body and on the brisket of cattle. Commonly referred to as heel flies, they lay 500 or more eggs on the hairs close to the skin and although they neither bite nor sting, their presence causes excitement in the herd. The eggs hatch into

maggots in three to four days and then burrow through the skin and travel through the body for five to seven months. In the early fall the grubs migrate to the backs of cattle where they cut small holes through the hide to admit air. In from forty to ninety days the grub matures, the hole gradually enlarges and the grub works its way out and falls to the ground. Many hides have from 50 to 100 grub holes and since a hide having more than five grub holes is graded number two and discounted one cent per pound, the loss in hide value alone is staggering.

Rotenone is effective in destroying the grub and is applied directly to the hide by either the Dust Method (1 part of 5% rotenone to 2 parts of pyrophyllite—rubbed into the infected areas), the Spray Method (7½ pounds of 5% rotenone to 100 gallons water at 400 pounds pressure), or the Dip Method (10 pounds of 5% rotenone and 2 ounces of wetting agent—sodium lauryl sulfate to 100 gallons water.) The cattle should remain in the vat with backs completely submerged for two minutes. Two systemic products now in use for grub control are (1) Co-Ral, applied as a spray at a concentration of 0.5% of the active material, and (2) Trolene, administered as a bolus according to the specifications of the manufacturer.

Shipping Losses

The growers of our nation's meat supply face innumerable problems in raising the animals for market. The fight against birth losses, disease, predatory animals, the elements—heat, cold and drought,—nutrient and vitamin deficiencies, and against the dishonest side of man himself is a continuous one. The finished animals go to market but they represent only 50% of the pigs, 70% of the cattle, and 70% of sheep that were born. A heavy toll is lost in this first battle of production.

The National Livestock Loss Prevention Board, organized in 1934 and reorganized in 1952 under the name of Livestock Conservation, Inc., for the purpose of studying the causes of livestock losses on the farm and on the way to market, has unearthed shocking figures to prove that man is his own worst enemy. He fails to fight disease and parasites as he should, he is negligent in removing hazards on the premises, he forgets that the hide or skin is not an armour plate to protect a product that he worked long and hard to produce. Those who do the right things find that losses may be caused by those who handle their product and over whom they have no control. The loss in shipping starts

on the farm. The precautions to be taken to prevent these losses are as follows: (1) Keep fences, feed racks, and barns in good repair and free from protruding nails and boards. (2) Keep feed lots and barn yards clean and free from trash, machinery, and other obstacles and provide good footing in the barns. (3) Do not crowd animals through narrow gates or runways. (4) Dehorn the cattle. (5) Use a canvas slapper instead of a stick, cane, or whip to herd livestock. (6) Have the truck standards on the outside and see that no sharp objects protrude in the truck. (7) Cover the truck floor with sand to provide a good footing, and wet the sand in warm weather but cover dry sand with bedding in winter. (8) Have cleated floor in loading chutes and see that no nails or sharp objects protrude from the sides. (9) Never get in a hurry when loading. (10) Prevent stock from moving about or trampling each other by separating mixed loads with partitions. A partition in a truck is good to prevent stock from moving, both for a full or partial load. (11) Cover front end of slatted trucks with canvas or heavy building paper in winter. (12) Caution driver to avoid sudden stops and starts and to make frequent inspection for "downers" and to see that animals are not piling up.

The annual loss in handling all classes of livestock that go to slaughter during the year is estimated to amount to over 50 million dollars. These losses are caused by bruises; crips and dead-on-arrival; crips and dead at the market; ante-mortem con-

Most Common Causes of Federal Carcass Condemnations.

Disease	Cattle	Calves	Sheep	Hogs
	Per Cent	Per Cent	Per Cent	Per Cent
Pneumonia and pleurisy	14 4	18 0	24 0	16 2
Other inflammatory conditions	33 0	11 0	1 8	10 3
Pyemia and septicemia	18 6	10 4	8 8	23 3
Tuberculosis	4	.		5 5
Neoplasms	15 0	5	4	1 5
Arthritis	9	3 5	1 6	11 7
Emaciation	2 3	23 0	17 2	2
Hog cholera	—	—	—	1 6
Sex odor	—	—	—	2 1
Injuries	1 0	7 0	2 5	2 1
Immaturity	—	19 0	—	—
Icterus (jaundice)	5	1 1	1 0	10 0
Caseous lymphadenitis	—	—	21 5	—

The main causes for condemnation of goat carcasses are caseous lymphadenitis and emaciation, and for horse carcasses they are emaciation, pleurisy, and pneumonia.

Ante-mortem and Post-mortem Inspection of Animals, Fiscal Year 1959.

(Inspections were conducted at 1,334 *establishments* located in 546 cities and towns. *Of this number* 529 were slaughtering establishments *and* 805 were establishments engaged in meat *processing* only.)

Kind of Animal	Ante-mortem Inspection				Post-mortem Inspection		
	Passed	Suspected[1]	Condemned[2]	Total	Passed	Condemned[2]	Total
Cattle.	17,211,106	79,720	1,125	17,322,557	17,266,608	54,108	17,320,716
Calves	5,135,921	3,507	627	5,140,055	5,111,509	27,865	5,139,374
Sheep	12,800,281	3,056	619	12,804,856	12,751,836	49,321	12,801,157
Goats	192,081	8	5	192,094	191,368	721	192,089
Swine	63,811,653	59,064	875	63,871,592	63,764,111	106,368	63,870,479
Horses[3]	88,048	34	18	88,100	87,705	377	88,082
1959 Total	99,272,390	143,295	3,569[4]	99,419,254	99,176,137	238,760	99,414,897
1956 Total	108,353,506	187,278	5,799	108,546,583	108,241,701	297,094	108,539,755
1953 "	92,365,021	224,962	7,810	92,598,698	92,302,113	288,624	92,590,737
1951 "	88,435,213	225,580	6,262	88,667,061	88,368,122	291,124	88,659,246

[1]"Suspected" is used to designate animals suspected of being affected with *diseases or* conditions that may cause condemnation in whole or part on special post-mortem inspection.
[2]*See preceding table for most* common causes of Federal carcass condemnations.
[3]Horses are slaughtered and their meat handled and prepared in *establishments* separate and apart from those in which cattle, calves, sheep, goats, and swine are slaughtered and *their meat* handled and prepared.
[4]*Includes 821 previously* suspected animals that died in pens.

demnations (for reasons other than disease); and carcasses and parts charged to mishandling. A more serious loss is that caused by internal and external parasites, estimated to total about $875,000,000 a year, of which over $100,000,000 is caused by cattle grubs alone.

The greatest loss is brought about by condemnations from disease, amounting to over $1,220,000,000 per year or total losses of $2,209,000,000 a year.

IV.

HOG SLAUGHTER

In the swine world, the word "type" is used to refer to (1) size or scale of an animal such as (a) the large type, (b) the intermediate type, and (c) the small type hog; and (2) to designate the ideal form or conformation for meat production purposes, such as the "lard" or "fat type" and the "bacon" or "meat type" hog. The distinction between the fat type and meat type hog lies in the proportion of fat to lean and the difference in the percentages of the primal cuts.

Government Live Hog Grade Standards

These standards (see weight and measurement guide, Chapter XX) were devised for the purpose of putting hog selling on a "Merit Basis" rather than on a "Weight Basis." It will be noted that the new standards do not feature the word type, such as meat or bacon type and fat or lard type, but infer through back fat thickness that is standard for the grade, that a hog eligible for that grade has (U. S. No. 1) the proper finish, (U. S. No. 2)

Market Classes and Grades of Slaughter Hogs.

Class	Weight	Grade	Class	Weight	Grade
	120-140 lbs.			270-300 lbs.	
	140-160 "			300-330 "	
	160-180 "			330-360 "	U. S. #1
Barrows	180-200 "	U. S. #1		360-400 "	U. S. #2
and	220-240 "	U. S. #2	Sows	400-450 "	U. S. #3
Gilts	240-270 "	U. S. #3		450-500 "	Medium
	270-300 "	Medium		500-600 "	Cull
	300-330 "	Cull		600 & Up "	
	330-360 "				
	360-400 "		Stags	All weights	Ungraded
	400&Up "		Boars	"	"
			Unclassified	"	"

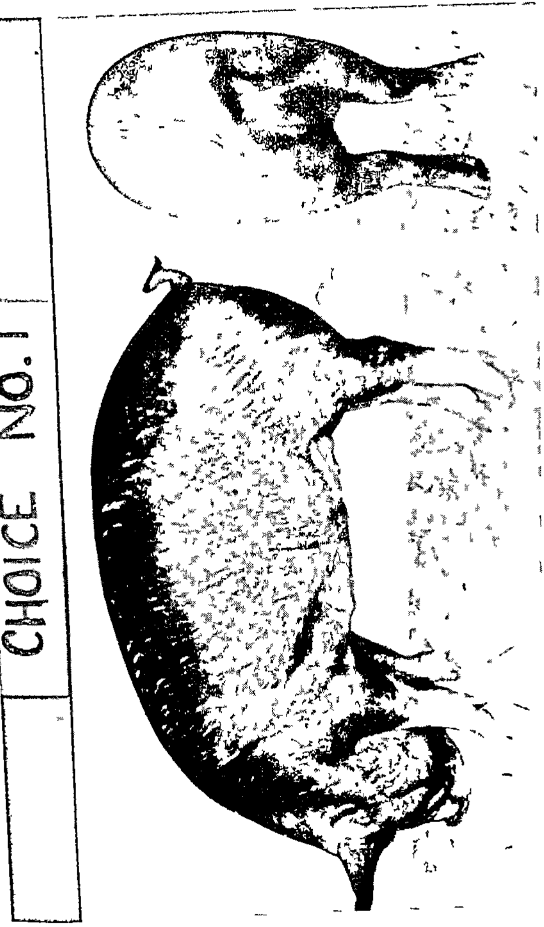

Fig 4 1—U S No 1 hog Back fat thickness of 1 2 and 1 8 inches for carcass length of under 27 inches to 33 or more inches

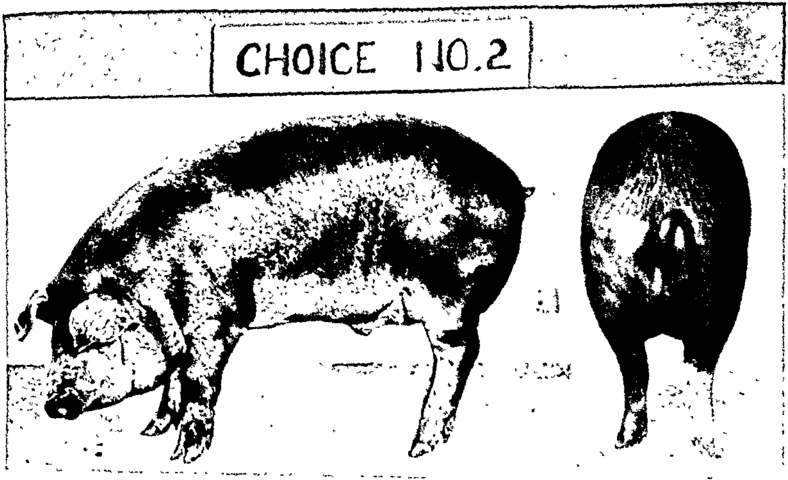

Fig. 4.2—U.S. No. 2. hog. Back *fat thickness of* 1.5 to 2.1 inches for carcass length of under 27 inches to 33 or more inches.

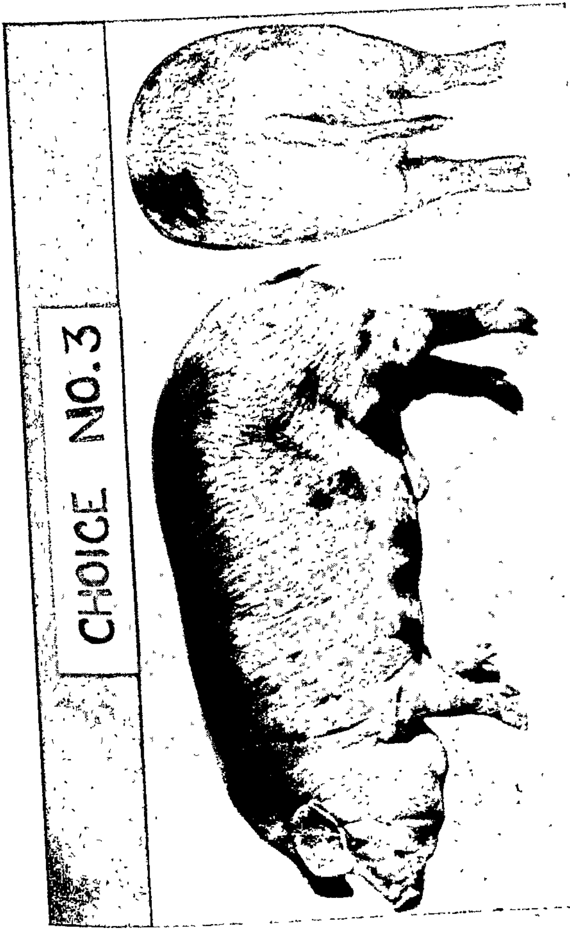

Fig. 4.3—U.S. No. 3 hog. Back fat thickness of 1.8 to 2.1 or more inches for carcass length of under 27 inches to 33 or more inches.

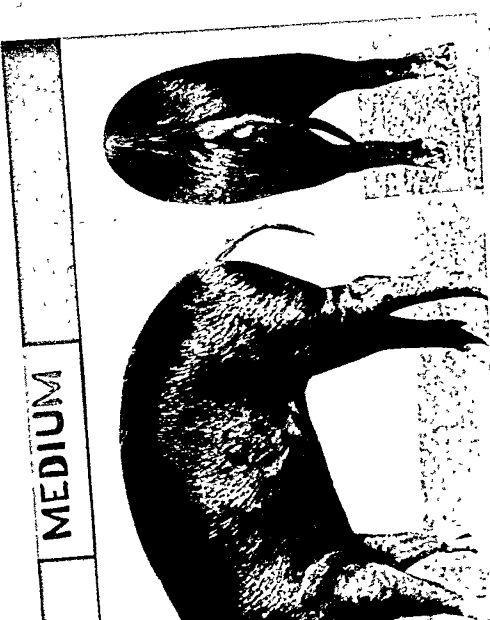

Fig. 1.1—Medium hog. Back fat thickness of .9 to 1.5 inches for carcass length of under 27 inches to 33 or more inches.

more than the necessary finish, (U. S. No. 3) overfinish; (Medium) is slightly underfinished and (Cull) is decidedly lacking in finish.

Since sex condition has exerted little if any effect on secondary physical characteristics, barrows and gilts are treated as a single class and the grade standards are equally applicable to both. The standards have not been made applicable to stags and boars, but a separate measurement standard has been made for sows.

Change of Goal

Hog type has changed several times in the past fifty years. These changes in type were made to increase size, strength of bone, length of body, arch and strength of back, depth of body-structural characters that increased prolificacy, fecundity, and the ability to make rapid and economical gains. This resulted in a change from the small boned, roly-poly, scruffy type hog to the medium and large type hog. The development of hogs with large bones, long legs, long bodies, great arch of back and considerable scale went to the point where the ordinary height hog fence was too low and entrances to standard hog houses too small. Poundage was the goal. Lard, during wartime, was as important a product as lean meat. It had no competition.

Hog size was getting out of hand, so type was given another workout, with the result that a medium size edition became popular. Lard was still the shortening. Today the picture has changed. Vegetable shortenings have made heavy inroads on the sale of lard. It was not the fault of lard as a fat but the failure of lard as a shortening when it had to compete against certain qualities that scientific research had given to vegetable shortenings.

In the meantime, the meat packer discovered that a staff of scientists in a properly equipped laboratory is as important to his business as the advertising department. He began to catch up on his home work and make better grades—but he had a late start. To date, he has produced a new and modern lard that is now the equal and in some respects the superior of any vegetable shortening.

The increasing consumer demand for lean pork made another hurdle that had to be taken in stride with the result that a genuine meat type hog has the pole position in this race for fewer calories. The development of the meat type hog in the

United States dates from 1934 when the Danish Landrace hog was first introduced. Since then many cross-bred and in-bred lines have made their appearance. Breed associations cooperating with state experiment stations went to work. The "probe" for determining back fat thickness became a popular tool. The United States Department of Agriculture set up new grades and grade standards based on conformation, quality and back fat thickness. These grades were designated as U. S. Choice #1, #2, #3, and Medium. Although these grades are presently in use by the trade, they do not represent the final goal that is in mind.

To develop this meat type hog, testing stations were set up in different sections of the heavy hog producing areas where breeders could have litter tests made by adhering to a designed program. If the two pigs submitted from each litter entered, met the specifications, the sire and dam acquired merit points toward a Lean Meat Certification. The litter mates entered had to meet the following requirements: (1) weigh 200 pounds or more in 180 days, (2) gain 1½ or more pounds per day, (3) 100 pounds of gain must be made on 300 pounds or less of feed, (4) the carcass must measure 29 inches or more (1st rib to aitchbone), (5) the loin eye must have an area of 4 square inches or more, and (6) the carcass must yield 52 per cent or more of the lean cuts (picnic, butt, loin and ham).

With more widespread cooperation of hog breeders, the consumer hog will arrive. Whether the consumer will stay pleased is another matter. If the pork cuts are lean and tasteless, NO; if they are lean and tender, YES. For myself, they must have juiciness and flavor; the cook will make them tender. To be juicy, they must be marbled. Suit yourself.

Priced on Merit

With corn plentiful and low in price, and hogs scarce and high in price, showing a wide corn-hog ratio[1], it is more profitable to market the corn as pork. So the feeder shovels in the corn and produces heavy, lardy hogs. As long as the buyer uses the double talk of wanting a meat type hog and yet pays the same price for

[1]By corn-hog ratio is meant the number of bushels of corn required to equal in value one hundred pounds of live hog. A normal ratio is considered to be 11.4 (the value of 11.4 bushels of corn will be the same as 100 pounds of live market hog) and a ratio above this means cheap corn and high priced hogs with profit to the feeder, whereas a ratio below 11.4 means high priced corn and a low price for hogs or a loss to the feeder.

both, where is the feeder's gain? That is why hogs must be priced on a Merit Basis.

The Danish Landrace

The well-known European breed, the Danish Landrace, famous for its bacon and high meat yield, originated in Denmark. The first importation made by diplomatic agreement between Denmark and the U. S. Department of Agriculture occurred in 1934. Since disease and trade regulations barred the importations of hogs into America from Denmark and other European countries, and since the agreement with Denmark was to use the importation solely for crossbreeding, the development of cross-bred strains was strictly a Federal project. The cancellation of the diplomatic agreement in 1949 made the purebred Landrace hogs available for importation but the prevalence of foot and mouth disease in Europe prevented any hogs being imported until the ban was lifted in Norway. The first importation of the Norwegian Landrace strain into the United States was made in February of 1954. The American Landrace (the recognized American purebred strain) is handled by the American Landrace Association formed in 1950.

New Breeds of the Meat Type Hog

A great deal of crossbreeding work has been done to produce a meat type hog with a higher yield of trimmed primal cuts and a correspondingly lower yield of fat than the conventional model. The result has been the development of a number of new breeds and the formation (on August 26, 1946) of the Inbred Livestock Registry Association of St. Paul, Minnesota. The new breeds admitted to the Association to date are as follows:

Minnesota #1 (48% Landrace— 52% Tamworth) Predominantly red

Minnesota #2 (60% Poland China—40% Yorkshire) Black and white; ears erect

Montana #1 (55% Landrace—45% Hampshire) Solid black

Beltsville #1 (75% Landrace—25% Poland China) Black with white spots; ears drooping

Beltsville #2 (58% Danish Yorkshire—32% Duroc—5% Landrace—5% Hampshire) Solid red; white underline

Maryland #1 (62% Landrace— 38% Berkshire) Black and white spotted; ears erect

San Pierre #1 (Berkshire—Chester White) Black and white
Palouse (65% Landrace—35% Chester White) Solid white; ears drooping
Minnesota #3 (31% Gloucestershire Old Spot—14% Welsh —11% Large White—6% Beltsville #2—20% Minnesota C-line Poland China—9% San Pierre—5% Minnesota #1—4% Minnesota #2)

The mention here of the new breeds developed for their meat type is made for academic purposes and is in no way a slight of our pure breeds of hogs. Unquestionably, the consumer's preference for lean pork is making the producer's task of giving him quality, a rather difficult one.

Slaughter Pigs

Roasting pigs range in weight from 30 to 60 pounds and include barrows, gilts and boars. Since they possess rather similar qualities, they are not graded according to sex. Above 60 pounds, the market recognizes classes of barrows and gilts of the following weights: 60 to 80 pounds, 80 to 100 pounds, and 100 to 120 pounds. Roasting pigs are not split at the breast nor between the hams. This permits stuffing with a sauerkraut or bread filling without leakage in roasting.

Age and Sex

Barrows and gilts under one year of age produce the highest quality pork. Sows find a ready market and are well suited to packing house needs where a great deal of the meat is incorporated with beef in the manufacture of various sausages. Young sows make desirable pork for farm home consumption where the larger cuts are well suited for large families.

A Good Slaughter Weight

The great demand by the consumer trade for 10 to 12 pound hams, and chops averaging four to the pound, has made it necessary for hogs to be marketed at weights ranging from 160 to 200 pounds. These weights are more profitable to the grower since it has been demonstrated that growth-weight-gains are cheaper than fat-weight-gains. However, in cases of a food emergency, it is considered desirable to feed them to heavier weights, thereby increasing the poundage of available pork with considerably fewer numbers. The most desirable weight hog for the

average farm family is probably 250 to 300 pounds. These heavier weights usually carry more finish and are therefore a juicier, more highly flavored product. The size of the farm family is generally such that the larger hogs can be used more efficiently.

Immobilization

The Federal Humane Slaughter Act went into effect on July 1, 1960. The act applies to those packers who transact business with Federal Agencies. A number of states have enacted laws similar to the Federal law and many more will follow. Ritual slaughter methods, such as Kosher killing, are exempt from the Act.

The Federal Act recognizes three methods of immobilization: (1) the mechanical, (2) the chemical, and (3) the electrical. To comply with the law, the use of any one of the three methods must produce complete unconsciousness with a minimum of excitement and discomfort. The mechanical stunners are the penetrating type and the concussion type. In the former, the captive bolt enters the skull, while in the concussion type, the force is delivered through a mushroom head on the end of the bolt. Blank cartridges with different powder loads for different sized animals are triggered off by contact to propel the bolt into the head. The least costly is the captive bolt pistol which resembles a pistol. The stunning can be administered to the forehead or in back of the poll.

The chemical method employs carbon dioxide gas, which, because it is heavier than air, can be held in a pit with a minimum loss of gas. The hogs ride in individual compartments down an incline into the chamber which holds a concentration of 65 to 75 per cent carbon dioxide. The time of exposure to render the hog unconscious depends upon the size of the animal and the production rate. As the hogs emerge, they may be stuck in the prone position or shackled and stuck on the rail.

In the electrical method, the hogs move along by conveyor to a squeeze box which halts them until the electric probe can be applied to the head for from one to four seconds, depending upon the weight of the hog. A five to seven second interval between stunning and sticking is advisable. The prone bleed is favored to reduce the time lapse.

The advantages of any of the above methods, aside from the humane factor, are the elimination of excitement, fewer internal

Fig. 4.5—The electric stunner. Hogs are driven into a squeeze whose moving sides propel the subject to the stunner. (Courtesy, Cincinnati Butchers' Supply Co., Cincinnati, Ohio.)

ham bruises, safer and better working conditions, more economical operation, and an improved product.

Farmers still go for the rifle. Aim the bullet at a point in the center of the forehead about one inch higher than the eye or right behind the ear, if shooting from the side.

Sticking

Hogs were usually shackled and hoisted mechanically to a sticking rail without stunning. Where hogs are stunned, gassed or shot, the sticking can be done with the hog lying on its side or by holding it on its back. A proper stick means a fast bleed and a quick black-out for the hog that was not previously immobilized.

A six-inch sticking knife, sharpened on both sides of the tip, is large enough for the ordinary hog. For large hogs (400-600 pounds), the seven-inch blade is desirable. If the hog is suspended, steady it by placing the flat of the hand on the shoulder (do not grasp a leg) and insert the knife several inches in front of the breast. With the point of the knife directed toward the tail (this is very important), give an upward thrust, dip the

Fig. 4.6—Sticking a hog (suspended.)

Fig. 4.5—The electric stunner. Hogs are driven into a squeeze whose moving sides propel the subject to the stunner. (Courtesy, Cincinnati Butchers' Supply Co., Cincinnati, Ohio.)

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Fig. 4.6—Sticking a hog (suspended.)

point until it strikes the backbone and then withdraw it. Care must be exercised in keeping the knife midway between the shoulders to avoid a shoulder stick. No twisting or cross cutting of the knife is necessary.

The blood yield: 500 lb. hog—12½ lbs.; 390 lb. hog—8½ lbs.; 200 lb. hog—5¼ lbs.; 100 lb. hog 4¾ lbs. blood. Dried blood (10% moisture) yield, 5 lbs. per 1,000 lbs. of live weight.

Aids in Scalding

Sufficient water of the right temperature, the removal of the hog when the hair slips readily, and plenty of elbow grease are necessary for a good, quick job. There are alkalies, however, that can be added to the water to loosen the scurf and make the skin whiter, but they do not make the hair come off any easier. A shovelful of wood ashes, a handful of borax, a teaspoonful of lye, or a half pound of lime added to a barrel of scalding water will aid materially.

A bell type scraper that is fairly sharp is an important factor in the effective removal of scurf. The round working sur-

Fig. 4.7—Hogs passing through a lane toward the CO_2 chamber. Hesitant hogs are urged forward by the light application of an electric prod. (Courtesy, G. A. Hormel & Co.)

Fig. 4.8—Emerging from the CO_2 chamber in an immobile and unconscious form after being in the chamber 45 seconds. The attendant is positioning the hogs on the conveyor so the heads are over the bleeding trough. (Courtesy, G. A. Hormel & Co.)

Fig. 4.9—All hogs on the sticking conveyor face in the same direction, backs toward the overhead belt conveyor and head over the bleeding trough. The sticker is about to stick a hog as it [illegible] this position. (Courtesy, G. A. Hormel & Co.)

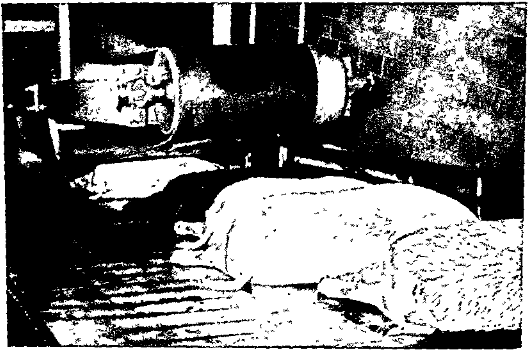

Fig. 4.10—Bled hogs emerging from the double conveyor. The overhead belt conveyor with movable weight rollers that press the belt against the hog is for the purpose of pinning the hog in place during the entire bleeding process. (Courtesy, G. A. Hormel & Co.)

Fig. 4.11—Hogs sliding into the soaking or rinsing tub from which they will move into a scalding tub and from there into the dehairing machine. The soaking tub can be eliminated, moving the hogs directly into the scalding tub. (Courtesy, G. A. Hormel & Co.)

Fig. 4.12—Loosening the tendons The small and large tendons on the back of the hocks are used for supporting the carcass on the gambrel stick.

face permits rapid dehairing and plenty of pressure can be applied to remove the bristles and dirt.

Scalding, Scraping and Eviscerating

A safe scalding temperature is 150° to 160° F., but water up to 180° F. can be used if the operator withdraws the hog as soon as the hair slips easily. Over-scalding causes the skin to contract around the base of the bristles, holding them tight, and is referred to as "setting the hair." If the hog is scalded in a barrel, insert a hog hook in the side of the mouth (for light hogs) or between the lower jaw bones and scald the rear half of the hog. After this half is scraped and the hind feet are shaved clean, open the tendons, and insert the gambrel. Using the gambrel for manipulating the hog, immerse the front half and scald and scrape it.

A good time to remove the tongue is while the hog is still on the scraping table, but after it has been dehaired and made ready to hoist. Cut down the center of the jaw from the cut made in sticking and then cut on either side of the tongue to the roof of the mouth. Insert the fingers under t[illegible]e, pull it

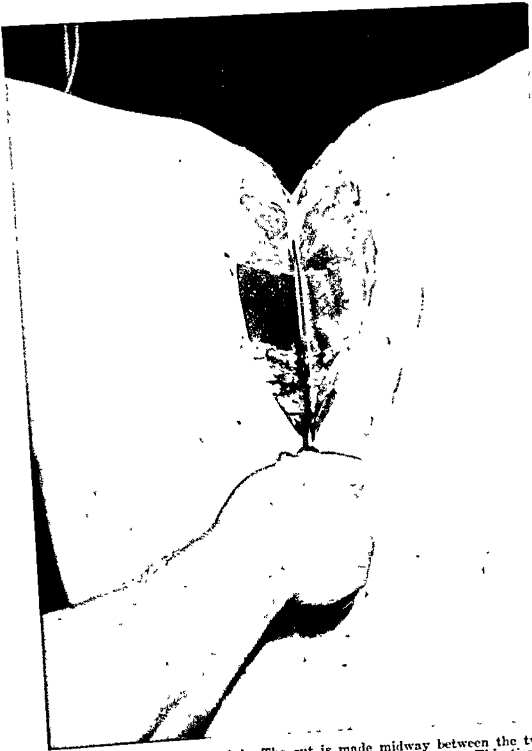

Fig. 4.13—Splitting the pelvis. The cut is made midway between the two hams, following the white tissue that separates the hams. This tissue leads to the fusion point of the pelvis which is cartilagenous in nature. Take a good grip on the knife in the position illustrated and give a sharp thrust toward the backbone. The hand will prevent the knife blade from cutting the bung gut.

out, using the knife to loosen the larynx, and sever the tongue at its base. Hoist the carcass, shave the remainder of the hair from the carcass, and rinse.

Make a cut down the belly from hams to breast. Avoid cutting the intestines by guarding the point of the knife. Split the pelvic bone by following the white tissue that separates the hams. Loosen the bung and pull out the intestinal tract. Remove the bile duct from the liver. Cut the diaphragm and remove the pluck. Split the carcass through the center of backbone and remove the face from each side. Loosen the leaf fat while the carcass is still warm.

Packer Slaughter of Hogs

The large daily slaughter of hogs by packers has made it necessary to devise mechanical equipment to handle large numbers of hogs per hour. Today a single dehairing machine will handle from 150 to 500 hogs per hour, depending upon its length. Large plants are equipped with twin machines that will handle up to 1000 hogs per hour.

Prior to slaughter, all hogs are subjected to an ante-mortem (before death) inspection, either at the scale or at some point on their way to the rest room. The animals that show signs of disease or illness are shunted into another pen and held as "suspects" to be slaughtered separately. Hogs are given a shower in the resting pen before they are driven to the dispatching room. If hogs are not immobilized, they are herded into a shackling pen in which there is a mechanical hoist. These hoists are of varying design. A chain shackle is placed below the hock of each hog by the attendants and the eye link in the specially designed shackle is then hooked to the hoist. This raises the hog to the sticking rail where a dispatcher makes the usual stick. The hogs move over the bleeding pit and are then automatically released into the scalding vat.

Vats are usually 3 to 3½ feet deep and 5 to 5½ feet wide. If mechanical duckers or immersers are used to keep the hogs under water, the depth is 4½ to 5½ feet. One pail of slaked lime per hour for each 20 feet of tub length is added by some packers to aid scalding. Some use a mixture of sal soda, lime and soft soap. A plant that is slaughtering 400 hogs per hour would use a scalding vat 56 feet in length and 139 degree water requiring the hogs to be immersed 4½ minutes. The hogs are propelled mechanically through the length of the scalding vat toward the

Fig. 4.14—Removing the face. The jowl remains on the carcass and the head is removed behind the ear at the atlas joint.

Fig 4 15—Halving the carcass Packers use large cleavers or the electric disc saw.

Fig. 4.16—Loosening the leaf fat. Insert the thumb under the leaf fat at the end of the sternum (X) and pull it up and away from the side, leaving it to hang attached to the base of the ham. Packers remove the leaf fat and use bell scrapers to free the inside of the bellies of any adhering leaf fat.

elevator (moving incline) which moves them into the dehairing machine. These machines are constructed of heavy V-shaped bars, a heavy steel frame and two shafts to which belt scrapers with metal tips are attached. The lower shaft runs from 55 to 60 R.P.M. and the upper shaft around 100 R.P.M. Both shafts run in the same direction. A hot water spray, 140° F., is played on the hogs as they pass through the dehairer toward the discharge end.

During the hard hair season (September, October, November) the water temperature should be 139°-140° F. and the immersion period 4-4½ minutes, while in the easy hair season (February, March), a temperature of 136° F. for 4 minutes is preferable. Proper scalding will eliminate singeing (except of the head) and will produce a skin that has good leather qualities.

As the hogs are discharged from the machine, several attendants open the tendons on the hind legs, insert gambrel sticks and place the hogs on rollers on the overhead tracks. A conveyor now moves the hogs slowly along a prescribed course where attendants do specified tasks, such as singeing, washing, shaving, eviscerating, removing the head, splitting or halving the carcass with a cleaver or electric saw, loosening the leaf fat from the sides of the carcass, exposing the kidneys for inspection, and facing the hams (removing the skin and fat from over the inside face or cushion of the ham.)

Each carcass and its viscera are given a post-mortem (after death) inspection and if it is found to be free from disease, the carcass is stamped "U. S. Inspected and Passed" and sent to the chill room. If the inspector finds the carcass diseased, the carcass and all the internal organs (viscera) are shunted into a government retaining room for further inspection. If the carcass is found to be diseased as suspected, it is stamped "U. S. Condemned" and sent to the tank room along with the viscera, where it is cooked under steam pressure in sealed tanks until all the disease germs are destroyed.

Skinning a Hog

This method of slaughtering a hog fits in well where there is a scarcity of labor. It is a one-man job and does not require hot water or scalding equipment. A hog trough or skinning rack to hold the hog on its back, a skinning knife, and a hoist or block and tackle are the only pieces of equipment necessary other than the sticking knife and stunning instrument. The hog can be held on its back by the use of the regular beef skinning rack. The

Fig. 4.17—Legging a hog.

Fig. 4.18—Siding a hog.

Fig 4 19—Pulling the skin off the back The use of a knife is not necessary in this operation except to remove the skin from over the top of the fore part of the shoulder Splitting the skin through the center of the back makes it easier to pull

Fig. 4.17—Legging a hog.

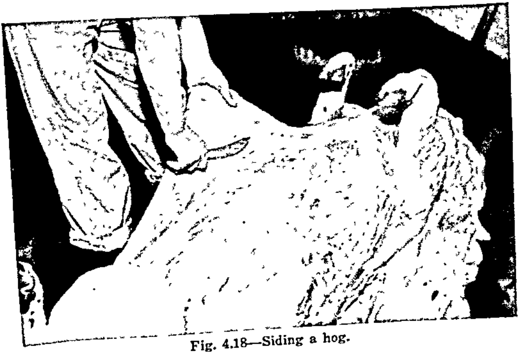

Fig. 4.18—Siding a hog.

Fig. 4.19—Pulling the skin off the back. The use of a knife is not necessary in this operation except to remove the skin from over the top of the fore part of the shoulder. Splitting the skin through the center of the back makes it easier to pull.

skin is opened in exactly the same pattern as the beef hide. (See Chapter V.)

The skin is opened down the back of the front legs, down the back of the back legs, and down the middle of the belly. Skin out the legs and then over the belly and down the sides. Take it easy and keep the knife tight against the skin at all times because the fat is soft and easily cut. Deep gashes made by uncontrolled strokes of the knife may do considerable damage to hams and bacons that are to be cured.

Remove the tongue, loosen the tendons on the hind legs, and insert the gambrel. The hog is hoisted, and with the loosening of the tail, the skin can be pulled off the back. After the face is skinned out, the carcass is washed and ready to be eviscerated.

The skin represents from 5% to 7% of the weight of the live hog. For other than home consumption, skinning is not economical because of this fact and also because it is a slower process. For home use, pork skin or rind is not necessary either in the curing or subsequent keeping of the cured meat. Curing tests conducted at The Pennsylvania State University have shown that skinned pork cuts take the cure faster and keep as well as unskinned cuts. The advantages are that the task can be done by one man; there is no messing around with hot water, no rinding of pork fat for rendering; the pork cures more rapidly and thoroughly and keeps as well as if it had a skin covering.

Depilating Hog Carcasses

A patented process of removing hair, stubble, and roots from hog carcasses after they have been scalded and passed through the dehairing machine was conceived by F. M. Tobin, of Rochester, New York, and developed by the Albright-Nell Company of Chicago, Illinois.[2] The process consists of mechanically dipping each carcass, after it is dehaired, into a hot solution (250°-300° F.) of rosin and cottonseed oil for a period of six to eight seconds. In some plants the nostrils of the hogs are plugged with cotton, the mouth is closed by means of a clamp and the bung is plugged with a six inch long dampened wooden plug to keep out the depilating compound. The compound forms a seal-like coating over the entire carcass; the heat turns the moisture

[2]Two types of automatic dehairers are popular. In the one type (vertical) the hog carcasses are suspended as they move through the dehairer (Albright-Nell), and in the other (horizontal) the hogs are not suspended but move through lying down (Boss).

in the skin and on its surface into steam which penetrates to the roots of the hairs and loosens them.

Fan cooling the dipped carcass has been found by some to be preferable to showering with water since the introduction of water into the dip causes foaming. When the rosin coating has plasticized, it is stripped from the hog by pull-rolling it down the carcass. With it are removed the sebaceous material loosened from the skin by the steam and also the remaining hair, stubble and roots not taken off by the dehairing machine. If the temperature of the dip is kept at 250° F., the skins are suitable for leather. The rosin dip is reclaimed by screening out the hair and refortifying with more plasticizer when the adhesive becomes too brittle.

Fig. 4 20—Depilating hogs. Dipped hog carcasses travel a short distance so that the adhesive will become plastic. The first operator starts stripping from the hind feet downward. Further stripping or "peeling off" is done by one or two more operators.

The present method employed by the originator of the system is to add water to the rosin and water mixture until it bubbles. The temperature is held to 240-250° F. The water and adhesive

form an emulsion which is plastic when cool. It can be scraped up easily, will not burn or yellow the skins and does not give off fumes.

The hog carcasses then move into a polishing machine which operates on the same principle as the Albright-Nell dehairer, but differs in that the canvas straps have six-inch metal chains attached to the ends rather than metal tips. The hair-free, white, and attractive carcasses are now ready for the eviscerating room.

Styles of Dressing and Yield

Three styles of dressing pork (excluding Wiltshires) are common in the United States. They are (1) packer's style—two

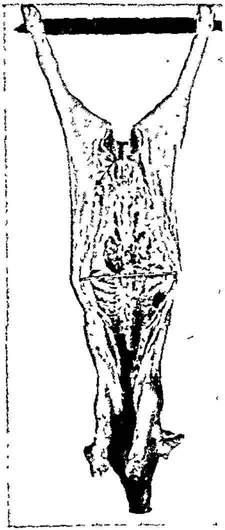

Fig. 4.21—Shipper style.

sides with jowls attached but head removed and leaf fat out; (2) shipper's style—unsplit carcass with head on and leaf fat in; (3) farmer's style—carcass split on either side of the backbone, making two sides and backbone.

The dressed yield of hogs is affected by fill (although hogs have but one stomach) and by the degree of fatness or finish. The hogs that grade as U. S. No. 1 are reported to give a warm dressed yield, head on, of 74%-76% or 68%-70% packer style (head off, leaf out, ham facings off). U. S. No. 2 carcasses range approximately 2% higher and U. S. No. 3 hogs from 76% to 80% (packer style). The medium grade hog will yield the same or lower than the U. S. No. 1 hog, depending upon its conformation.

In estimating the cost of the carcass, divide the dressing

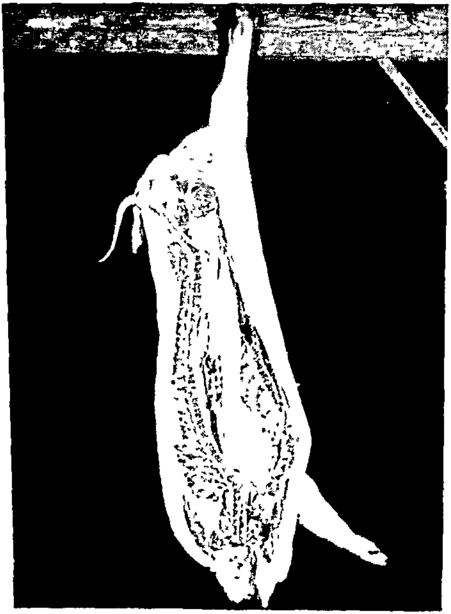

Fig. 4.22—Packer style.

percentage into the price per hundred pounds live weight. This figure, however, does not include the true cost of the carcass since labor in handling and slaughtering and overhead have not been included.

Chilling the Hog Carcass

The carcass is split through the center of the backbone with a saw or a cleaver, dividing it into two sides. The head is removed but the jowl is left attached to the carcass. The leaf fat should be pulled loose from the inside of the carcass and left attached at the ham. This hastens the chilling of the side

Fig. 4.23—Farmer's style.

and lessens the danger of souring. After the blood is washed from the neck, the carcass is moved into the chill room where the temperature is held around 34° F. Where large numbers of warm carcasses are handled, the chill room is generally precooled to a temperature several degrees below freezing to compensate for the heat from the carcasses which raise the cooler temperature considerably.

The cooler shrink on a 24-hour chill will average between 2% and 3%, depending upon the humidity of the cooler. The inside temperature of the ham should reach 38° F. for thorough chilling.

Wiltshire Side

A Wiltshire is an English style side of pork that must conform to rather rigid specifications in order to satisfy the English market. It consists of the entire side or half of a hog carcass minus the head, feet, aitchbone, backbone, tenderloin, and skirt. The sparerib and neck rib are left in the carcass.

The ideal side weighs approximately 60 pounds; minimum 40 pounds, maximum 80 pounds. The ideal length from the fore part of the first rib to the fore end of the aitchbone knob is 29 inches; minimum 26 inches, maximum 32 inches. Wiltshires are cured and then packed, either in bales or boxes, for export. They are smoked after they reach their destination.

Canadian Hog Marketing

In 1940, Canada instituted the plan of marketing hogs on the rail instead of on foot. This system of marketing, based on rail grading, has standardized the Canadian hog market and operates as follows: Ownership of the hog is established by tattooing an indelible brand on the shoulder of each animal. The hog is dressed and weighed. A government grader marks the grade on the grading tag with the tattooed identification number. Part of the tag is sent to the accounting office for the estimate of payment, the other part of the tag is attached to the carcass. The farmer receives a statement with his check showing the grade, the price per grade, insurance, Dominion premium and other charges. The government pays the farmer bonuses for grades A and B1 hogs.

General

Aged boars are practically inedible because of sex odor and should be sold to a packer who processes them for their by-prod-

ucts. Castrate young boars several months before slaughter.

Cracklings is the term applied to the pressed, rendered pork fat remaining after the lard has been extracted.

Trichina, a microscopic parasite, is found to be more prevalent in garbage fed hogs.

The lowest monthly average price paid for live hogs at Chicago since 1900 was $3.10 per hundredweight, December, 1932. The highest price on record was $30.50 paid September 11, 1947.

The record receipts of hogs on the Chicago market in a single day was 122,749 head on December 15, 1924, as compared to a 10-year daily average receipt of 17,500 head. Prior to the Second World War, the United States consumed 85% of its pork production.

The lowest cash price for prime steam lard per 100 pounds on the Chicago market since 1896 was $3.57½ (June, 1932) as against the record price of $40.00 (October, 1946).

The greatest amount of lard exported in any one year was one billion, 39 million pounds in 1924.

[3]It requires the slaughter of 145 female hogs to produce one pound of fresh ovaries from which corpus luteum and ovarian extracts are prepared. These extracts are prepared in either powder, tablet, or liquid form, and are of great therapeutic value in treating menstrual disorders in women.

One source of pharmaceutical pepsin is the lining of the pig's stomach at the pyloric end.

Pigskin has been replaced by cattle hides as a covering for footballs. Its most common use is in leather for gloves, pocketbooks, handbags, brief cases, toilet cases, tobacco pouches, book binding, and leggings.

The greases secured from inedible hog fat are "A" white grease (less than 2% free fatty acid), "B" white grease (less than 3.5% free fatty acid), and brown grease.

Lard oil is made from "A" white grease and is used for making a high grade lubricant used on delicate running machine parts. The oil from "B" white grease is sometimes called "extra neatsfoot oil" and is used in giving added viscosity to mineral oils. The oils made from the brown grease are used in compounding cutting oils, heavy lubricating oils, special leather oils, illuminating oils, and stearic acid, and are combined with paraffin in candle making.

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[3]Clemens, R. A. *By-products in the Packing Industry*, (University of Chicago Press, Chicago, Illinois.)

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About 8% of the hogs slaughtered in the United States are slaughtered on farms.

Floor and wall tile made from tanned pig skin from fat backs is a new idea. The claim is that they are tough and resilient and scuff slightly but the abrasion loss is negligible. They are easy to clean and wax and their wearing quality is as good or better than competing floor coverings.

Cattle, Hog, Sheep, and Lamb and Calf Slaughter by States.[1]

State	Cattle		Hogs		Sheep and Lambs		Calf
	Total	Annual Average *per Head*	Total	Annual Average *per Head*	Total	Annual Average *per Head*	Total
	1 000 Head	Pounds	1 000 Head	Pounds	1 000 Head	Pounds	1 000 Head
New England[2]	208 9	1,040	546 0	235	270 3	87	372 7
New York	478 0	1 117	1 729 0	216	577 0	90	900 5
New Jersey	393 5	1,230	1,533 0	198	1 222 0	93	311 9
Pennsylvania	803 0	1 078	2 877 0	221	371 6	89	603 5
Ohio	1,086 5	989	4 395 0	219	186 2	87	169 4
Indiana	584 0	999	4,965 0	219	203 1	96	109 1
Illinois	1,494 0	1,054	5 600 0	261	487 5	94	339 5
Michigan	691 5	1,009	1,509 0	233	694 5	97	407 0
Wisconsin	912 0	1 063	3 701 0	237	193 0	101	1,087 5
Minnesota	1,308 0	1,058	5,611 0	249	869 5	102	255 6
Iowa	2 279 0	1,067	15,162 0	216	1 374 5	100	369 4
Missouri	1,032 0	1,006	4 189 0	240	628 5	98	1,056 0
North Dakota	47 3	1,079	107 7	260	92 9	108	5
South Dakota	382 8	1 071	2 372 0	257	643 0	103	4
Nebraska	1,960 0	1,012	4 425 0	253	1 026 0	103	11 6
Kansas	978 0	1,012	3,083 0	246	330 7	99	87 8
Del and Md[3]	136 0	1,075	911 0	218	103 0	90	103 2
Virginia	139 6	1,016	2,031 0	213	9 4	81	211 8
West Virginia	63 4	955	180 9	221	10 5	91	13 9
North Carolina	129 7	869	1 013 5	220	1 5	98	22 9
South Carolina	93 2	809	465 5	216	1 0	90	41 4
Georgia	262 0	776	1 640 0	207	1 3	85	67 3
Florida	286 6	870	567 5	210	1 1	75	113 5
Kentucky	188 8	935	1 434 0	226	241 2	89	33 9
Tennessee	248 0	878	2 115 0	226	70 7	80	183 3
Alabama	176 7	839	850 0	214	1 4	84	45 5
Mississippi	228 7	803	584 5	222	5	92	81 5
Arkansas	112 4	802	276 4	221	1	80	27 5
Louisiana	179 8	763	193 8	206	2 0	74	192 2
Oklahoma	294 8	881	723 5	240	6 8	97	69 7
Texas	1,222 5	881	1,962 0	228	1,007 0	91	720 0
Montana	83 9	989	268 5	232	6 5	95	2 6
Idaho	169 5	1,014	179 4	217	42 7	107	8 7
Wyoming	17 4	1,012	36 3	227	3 7	108	1 2
Colorado	906 0	1,051	562 5	232	1,423 0	105	15 0
New Mexico	67 7	890	97 0	228	41 6	107	2 1
Arizona	144 1	857	173 4	225	1 6	103	11 3
Utah	176 8	986	333 9	229	269 0	10'	11 3
Nevada	25 9	1 026	7 1	219	10 5	103	3 2
Washington	399 5	1,014	838 0	217	120 6	103	25 2
Oregon	232 0	989	486 5	218	234 9	99	30 5
California	2,207 0	1,046	1,846 0	231	2 388 0	104	458 5
U S	22,930 5	1,014	81,581 9	237	15,179 9	99	7,683 2[4]

[1]Includes *slaughter under Federal inspection and other wholesale and retail slaughter;* excludes farm slaughter

[2]Includes Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut.

[3]Includes the District of Columbia.

[4]Average weight per head. 214 pounds.

Processing Hog Hair

The hair is cooked in wooden vats either in (1) plain water, (2) water with acetic acid added (100 to 1), or (3) water with detergent (76% solid caustic soda). The cooking loosens the cuticle and scurf and requires from 4 to 6 hours. The hair passes from the cookers into high speed cylinders studded with 3½ inch steel pins into which hot water and steam are fed. These washers and pickers remove the cuticle and scurf and the picked hair passes by conveyor to the feed apron of a drying machine where blasts of hot air dry and fluff it. A suction tube draws the dried and fluffed hair into a winnowing machine which removes the dust and fine hair. A cut away intake in the suction tube permits the toe nails to drop through. The finished hair is baled in burlap bags. The yield of finished hair on the basis of a 10% moisture content is 35% in summer and 75% in winter.

V.

CATTLE SLAUGHTER

MARKET CLASSES AND GRADES OF SLAUGHTER CATTLE

Beef Steers (Yearlings)

Light weight	800 pounds and down	Prime, choice, good, standard, commercial, utility, cutter, canner.
Medium weight	800 to 950 pounds	
Heavy weight	950 pounds and up	

(2 years old and over)

Light weight	1100 pounds and down	Prime, choice, good, standard, commercial, utility, cutter, canner.
Medium weight	1100 to 1300 pounds	
Heavy weight	1300 pounds and up	

Butcher Stock

Heifers—Prime, choice, good, standard, commercial, utility, cutter, canner.

Cows—Choice, good, standard, commercial, utility, cutter, canner.

Bulls—Choice, good, standard, commercial, utility, cutter, canner.

Stags—Choice, good, standard, commercial, utility, cutter, canner.

Beef steers (1½-2½ years old) furnish the bulk of the high-grade beef sold on the market. Open (not bred) and spayed (ovaries removed) beef heifers furnish a high-grade meat that is even finer in texture than steer beef but heifers run slightly lower in dressed yield due mainly to a greater amount of internal fat. Buyers discount prices offered for open heifers as insurance against pregnancy which lowers dressing percentage. Tests have

shown very small differences in yield of various cuts between steer and heifer carcasses of the same grade.

Most high-grade beef steers and heifers are grain fattened. Grass-fed cattle generally fall into the lower grades and great numbers are bought by Corn Belt farmers for further fattening.

Slaughter Cattle

All of the market classes and grades of cattle bought for immediate slaughter come under this general classification.

Prime Cattle

The prize winning animals exhibited at the premier fall and winter livestock shows typify the highest segment of this grade as to form, finish, and quality. The number of steers eligible for this grade has increased considerably under the revised grading system. Since yield increases with added finish, this grade naturally shows superiority in this respect. Prime cattle should dress from 60% to 67%. The highest reported yield to date was 76¼% made by a spayed Angus heifer shown at the Smithfield Fat Stock Show in England.

Choice Cattle

Animals to grade as choice should have most of the characteristics of the prime grade in moderation. They should dress from 58% to 60%.

Good Cattle

Cattle of this grade not only carry less finish than choice animals but also lack the uniform beef conformation of that grade. They are more uneven in their top, are slightly higher off the ground, and do not show the uniform depth of body nor the fullness of muscling characteristic of the choice grade. They should dress from 52% to 58%.

Standard Cattle

These are young, soft boned cattle that were formerly included in the commercial grade. They are generally light weight, unfinished cattle of either sex, and deficient in conformation. The yield is from 45% to 52%.

Commercial Cattle

Cattle showing advanced maturity and consisting in the

main of breeding cows make up this grade. The yield is from 42% to 52%.

Utility Cattle

These cattle are rangy, angular and thinly fleshed and vary considerably with age.

Cutter and Canner Cattle

These grades are represented mainly by old cattle having the characteristics of the dairy breeds which lack the inherent meat qualities of beef animals.

BEEF OPERATIONS

Cattle should be kept off feed at least 24 hours previous to slaughter. Results of a test conducted at the Pennsylvania Agricultural Experiment Station to determine the effects of fasting beef animals for periods ranging from 24 hours to 48 hours on the yield and appearance of the carcasses were definitely in favor of the longer fast period. The fasted animals bled out more thoroughly, were easier to dress, and the carcasses were brighter in appearance than those from cattle allowed feed up to the time of slaughter. Undue rough handling or excitement causes the blood to be forced to the outermost capillaries from which it will be unable to drain as thoroughly as it would under normal heart action. *This results in a fiery carcass (pink tinge to the fat), which has* lower keeping qualities due to the retained blood.

Stunning

Tie the animal to a post or a ring in the floor, or drive it into a knocking pen, if available, and deliver a sharp blow midway between the eyes and the top of the poll.

In the packing plant which wishes to comply with the Humane Slaughter Act, one of a number of compression guns can be used. They are made with long or short handles and are of the penetrating type. They operate on the forehead or behind the poll. A nonpenetrating type requiring a heavier charge is forthcoming. Electrical stunning of cattle needs further development.

Sticking

STANDARD METHOD

Take a position with your back to the brisket, if the animal is on the floor. Make an incision over the point of the brisket

Fig. 5.1—Power actuated stunner. Uses 22 caliber rim fire power loads in five graded strengths for effective stunning of all weights of cattle, calves, hogs and sheep. New packing house tool meets all legislative and humanitarian requirements, can deliver effective stunning blows to pates or backs of heads. Automatic penetrator rod retraction, lever type trigger, sleeve style bolt, light weight and compact design are among the features of the new stunner, made for easy portability and comfortable one-hand operation. (Courtesy, Remington Arms Co., Bridgeport, Conn.)

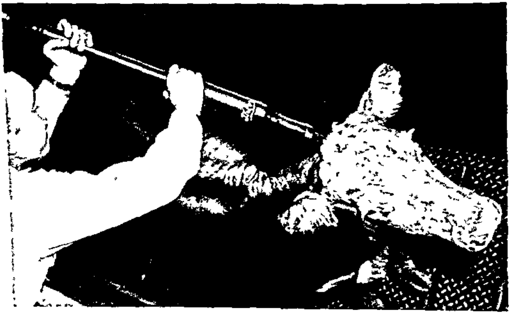

Fig. 5.2—A compression stunner for cattle. In this case, the stunner (penetrating type) is aimed at the medulla oblongata. (Courtesy, Thor Power Tool Co., Aurora, Ill.)

toward the jaw. Insert the knife in front of the brisket at a 45° angle and sever the carotid arteries and jugular vein.

KOSHER METHOD

Hoist the animal without stunning and cut across the throat. The sticking is done by the rabbi or schlachter.

Heading

(1) Open the hide from the horn to the nostril and skin out the front of the face. (2) Continue the opening from the stick

down through the center of the jaw and skin out the side of the face. (3) Turn the head and skin the opposite side. (4) Grasp the jaw in one hand, bend the head back on its poll and remove the head by cutting through the Adam's apple and the atlas joint.

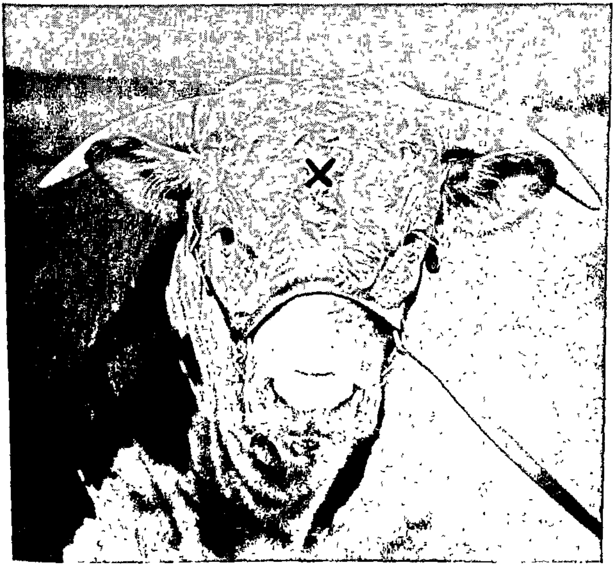

Fig. 5.3—X marks the spot—to hit.

Shanking or Legging

Place the skinning rack under the withers and roll the animal on the rack. If a beef pritch is used instead of a rack, insert a pritch on either side of the brisket. Open the hide on the rear of the fore shank and the rear of the hind shank, continuing the cut to the mid-line to be made on the belly from the neck to the bung. Sever the tendon by cutting across the shank and snip off the dew claws. Skin out the shanks and remove them at the break or smooth joint below the knee and hock. T[illegible]ak or smooth joint is at the enlargement, about an inch[illegible]e knee joint,

Fig. 5.4—Sticking. The position of the feet of the operator stretches the neck of the animal.

just where it tapers down to the canon bone. On the hock it is about an inch from where the taper takes place. A decided groove is evident when the knife rests at the proper spot. Cut around to either side and then grasp the shank near the foot and give a sharp thrust downward and outward from the stifle joint. Occasionally the break joint will have ossified in aged animals, in which case it will be necessary to use a saw.

Siding

Grasp the hide firmly with an upward pull and with long, smooth strokes of the skinning knife, remove the hide down over the sides. The bevel of the knife must be flat to the hide to avoid making cuts or scores. This is one of the most difficult tasks in the skinning operation and requires considerable experience before satisfactory progress can be made. Attempt to avoid scoring or cutting the hide, as this lowers its value for leather.

Opening

Cut through the center of the brisket with a knife and then saw through the sternum. Insert the handle of the knife in the

Fig. 5.5—Skinning out the front of the face.

Fig. 5.6—Skinning the side of the face.

Fig. 5.4—Sticking. The position of the feet of the operator stretches the neck of the animal.

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Fig. 5.5—Skinning out the front of the face.

Fig. 5.6—Skinning the side of the face.

Fig. 5.7—Removing the beef tongue.

abdominal cavity with the blade leaning backward and open the belly cavity. In case of a male, the pizzle must be removed first. It is well to pull the small intestines out of the abdominal cavity before separating the rounds at the aitchbone. Each top round muscle is covered with a tough membrane and where the two join over the high point of the pelvis they form a decidedly heavy, white appearing membrane. Follow the membrane and avoid cutting into the muscle. The knife is then readily forced between the soft cartilage that joins the pelvic bone at this point. In old animals, the pelvis will have to be sawed.

Rumping

The beef tree is inserted in the hocks and the carcass raised to a convenient height for tailing and removing the hide from the round and rump. Skin around the base and split the hide the entire length of the tail. Sever the tail two joints from the body and skin entirely around its base. By placing a cloth over

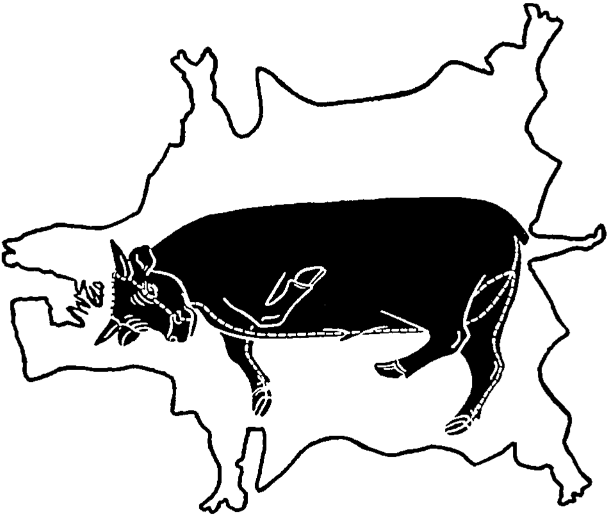

Fig 5 8—The pattern of the hide The dotted line indicates where the opening is made in the hide (Courtesy, U S D A)

the skinned base stub, the tail can easily be pulled out the remainder of the way Cut around the bung and let it drop inside the carcass

Eviscerating

Loosen the fat and membrane that hold the bung gut and bladder to the backbone A few well placed cuts of the knife will allow the paunch and intestines to drop to the floor or into the gut cart The liver should be loosened with the hands and then severed from the backbone with a knife Remove the gall bladder by cutting across the top of the bile duct at the center of the liver and peel it rather than cut it out

The membrane separating the abdominal from the thoracic cavity is called the diaphragm and consists of the diaphragm muscle and the membrane joining the muscle Cut out only the membrane as the diaphragm muscle is good edible meat and is known as the *skirt* The organs that lie in the thoracic cavity

Fig. 5.9—A beef pritch keeps the animal on its back.

are called the *pluck* and consist of the heart, lungs, gullet, and windpipe.

Backing

That part of the hide attached to the outside round is either pulled or pounded off. The backing operation consists in running the knife around the back between the hide and the carcass and letting the hide drop of its own weight. The hide may also be removed by cutting in from either side as a completion of the siding operation.

Halving

Splitting the beef into sides by sawing or chopping through the exact center of the backbone is begun before the forequarters of the carcass are off the floor. A beef-splitting saw or large cleaver is used. Standing on the belly side of the carcass, saw through the caudal vertebrae to the sacrum and then take up a position on the opposite side of the carcass and saw through the sacrum and the lumbar vertebrae. Special care should be taken to split each superior spinus process of each vertebra since this has an important bearing on the weights of wholesale and retail

Fig 5 10—Removing the fore shank

loin, rib and chuck cuts Since the feather bones in the dorsal region (rib area) of the backbone are quite long and narrow, it is desirable to first saw through the main body of the backbone This is done by pointing the saw toward the neck and sawing at an angle to the backbone Sawing through each individual dorsal vertebra at a 45° angle assures the operator of a 50 50 split of the feather bones since the spine (if the saw is in the center) steers the saw blade and holds it steady

After the splitting is completed to the point where the hide is still attached, the carcass is hoisted and the hide removed from the shoulders and neck The splitting of the forequarters is completed and the vein removed from the inside of the neck

Washing and Shrouding (Clothing)

All blood and dirt should be washed off both the inside and outside of the carcass and the shoulders should be pumped by

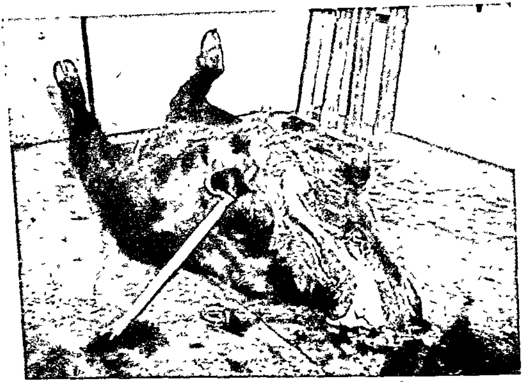

Fig. 5.9—A beef pritch keeps the animal on its back.

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Fig. 5.12—Siding can be started at the fore or rear end. This beef is held on its back by means of a skinning rack.

Fig. 5.11—Removing the hind shank.

Fig. 5.15—Splitting the pelvic bone.

Fig. 5.16—Removing the tail.

Fig. 5.13—Splitting the brisket.

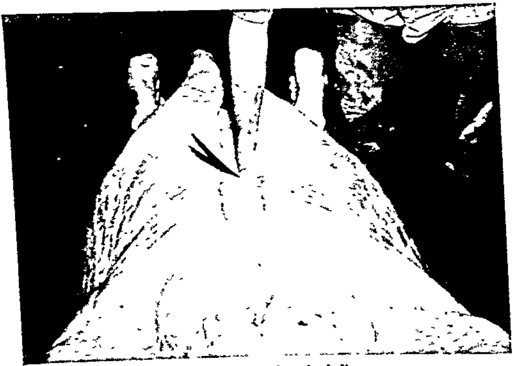


Fig. 5.14—Opening the belly.

Fig 5 15—Splitting the pelvic bone

Fig 5 16—Removing the tail.

Fig. 5.13—Splitting the brisket.

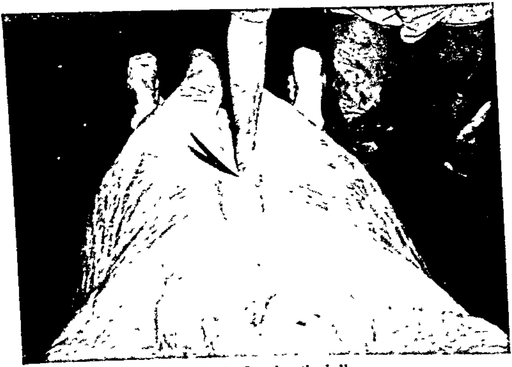


Fig. 5.14—Opening the belly.

Fig. 5.15—Splitting the pelvic bone.

Fig. 5.16—Removing the tail.

Fig. 5.13—Splitting the brisket.

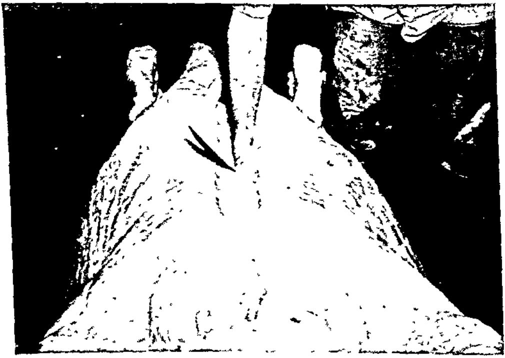


Fig. 5.14—Opening the belly.

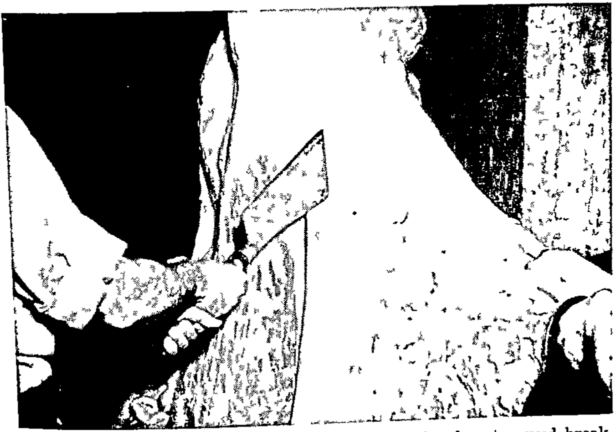


Fig. 5.18—Pounding the hide from the round and hip loin to avoid breaking the fell.

working the shanks up and down. Cold or lukewarm water is used to wash the carcass. Shrouds made from unbleached duck cloth are immersed in warm water and pinned over the outside of the sides of warm beef before they are moved into the cooler. The shrouds absorb the blood, smooth the external fat covering and cause the fat to appear white and dense. The shrouds or cloths are removed after the carcass has chilled. A practice that is gaining in popularity is to wet the clothing in a 14° to 18° salimeter strength salt brine at a temperature of 115° to 125° F. It is claimed that brined cloth has greater adhesiveness and that it helps the cloth to absorb blood and more of the bruise discoloration which may be on a carcass. Cooler shrinkage averages 2% to 3% in the first 48 hours or from 4% to 6% in the first two weeks. The amount of cooler shrinkage is dependent upon cooler humidity and the finish of the carcass.

Can-Pack On-the-Rail Beef Dressing

Canada Packers, Ltd., were the designers of a system of on-the-rail dressing of beef that has eliminated stooping while working. There are 14 stations in the operation. Driving, knocking, and shackling the beef are performed by one man at station

Fig. 5.17—Pulling the hide from the outside round. The knife is not used in this region because it is easier and swifter to pull or pound off the hide. The above heifer carcass is identified by the lean area of the gracilis muscle and the presence of the dug or udder.

Fig. 5.20—Dropping the hide over the shoulders and neck

Fig. 5.19—Backing.

Fig. 5.20—Dropping the hide over the shoulders and neck

Fig. 5.19—Backing.

Fig. 5.22—Splitting or halving a beef carcass.

Fig. 5.21—Can-Pak hide puller.

one. Sticking and scalping (heading) are performed at station two. One worker legs, butts, inserts trolley and removes the shackle at the third station while a fourth worker legs, butts and inserts trolley in the second leg at fourth station. At the fifth station, one worker removes the front foot, performs work on the brisket, dehorns, and removes the head. A sixth worker rims, clears shanks, and works on the chuck and neck. At station

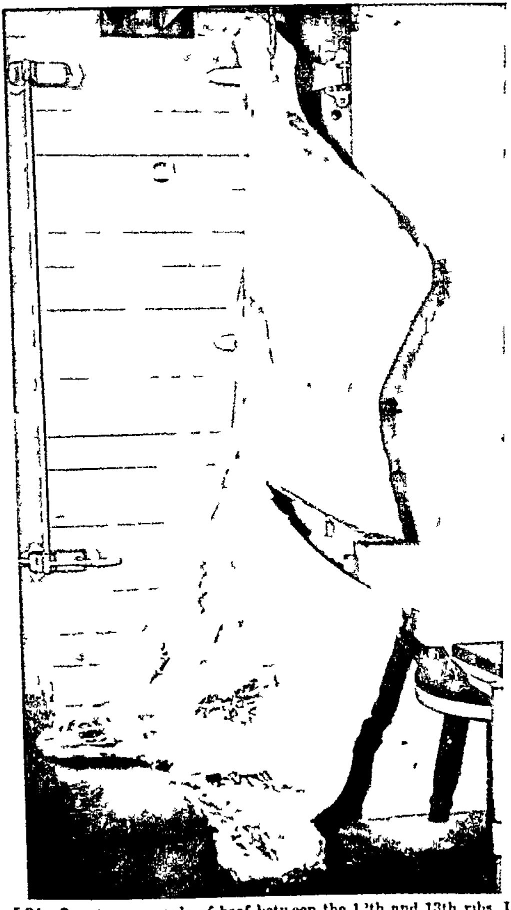


Fig 5 24—Quartering a side of beef between the 12th and 13th ribs Unlike this illustration packers pin the neck up toward the shoulder with a large wooden skewer before shrouding This eliminates the long neck, as such

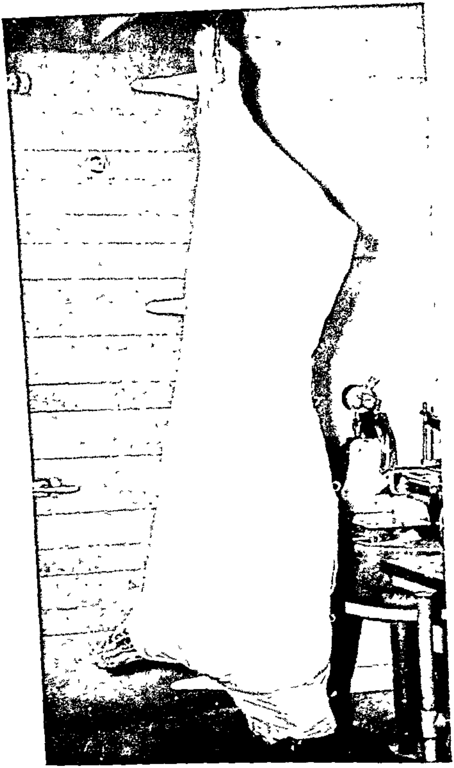


Fig. 5.23—Shrouding or clothing. This gives a smooth, dense appearance to the fat.

Hide Yield

The weight of the hide varies with the breed of cattle. Herefords carry the heaviest hides, followed by the Aberdeen-Angus, Holsteins and Brown Swiss. Shorthorns and the dairy breeds carry the lightest weight hides. Hides from the average run of cattle slaughtered by the large packing concerns average 7% of the live weight of the animals. Slaughter records of the purebred steers killed and dressed in the meats laboratory of The Pennsylvania State University show that Hereford hides average 8½%, Angus 7½%, and Shorthorn 6½% of the live weight of the animals.

Hides should be trimmed (ears, lips and fat off), spread out, hair side down, in a cool place and given a liberal application of ice cream salt or coarse sack or stock salt. It requires from 15 to 18 pounds of the latter to cure a 50 to 70-pound hide or ½ pound of rock salt per pound of hide. For best results, the hide cellar should have a uniform temperature of 50°-60° F. and lower for long time storage. Hides will shrink from 15% to 25% in curing and 40% to 50% if left to dry. It has been estimated that the hide represents one-third of the value of all other by-products of

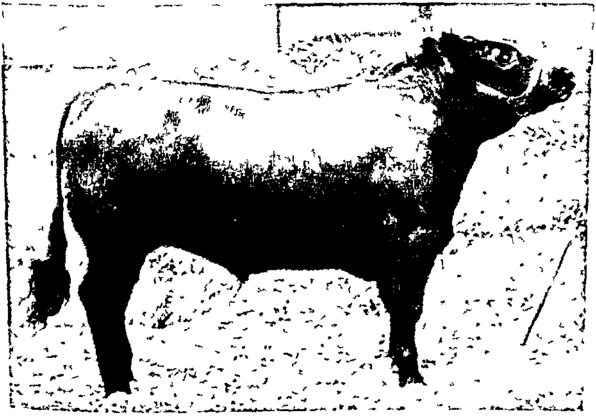


Fig. 5.26—Third place steer (Slaughter Class), 1933 International Livestock Exposition, Chicago. Our present winners may be closer to the ground, but no better in body conformation or smoothness of finish.

seven, work is performed by a single worker on the rump, tl bung is dropped and tail is pulled. The rosette is cleared, usii an air-operated skinning tool, flanking performed and hide pull by the machine operated by one man at station eight. The brisk is sawed and the carcass eviscerated at station nine and compl tion of the hide pull is made at station ten. In the pull-off t hide drops directly into a chute. The splitter and scriber at st tion eleven operates on an elevating bench, using a foot switc Trimming is done at station twelve, weighing at station thirtee and shrouding at station fourteen.

Drift

Cattle will lose from 3% to 4% of their weight if kept feed for 24 hours. This is referred to as shrink or drift. It h become a general practice for buyers to demand this shrir either as a mathematical deduction from full-feed weight or an actual off-feed practice. If a reputation means anything tc feeder he will never salt or fill his cattle before sale time. cattle buyer is seldom fooled and then only once by the sa man. The carcass yield will betray the perpetrator.

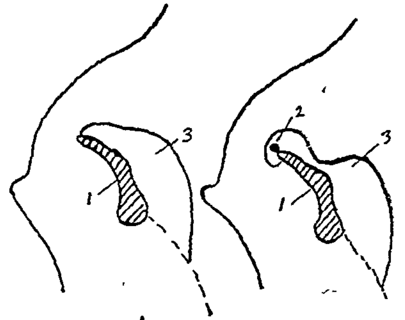


Fig. 5.25—A—The contour of the lean area of the gracilis muscle heifer carcasses. B—The same area on steer carcasses. (1) Aitchbc (2) pizzle eye; (3) lean area of gracilis. This shows the method identifying steer from heifer rounds when the rump and shank h been removed.

Fig 5 27—The carcass of the steer shown in the preceding illustration won first prize, though the steer itself won only third prize

cattle and that the United States uses one-fifth of the world's supply.

Yield of Edible By-products

The offal fat (internal or killing fat) will average around 3% of a beef animal's live weight, ranging from 1% in good cattle up to 6½% in prime cattle. The heart, tongue and liver are not weighed in with the carcass in determining dressed yield. They are sold separately. The kidney is considered a part of the carcass and is never removed in slaughtering. The liver will average about 1% of the live weight, the heart .35%, the tongue .25% and the liquid blood about 3½% or 7¼ pounds of dried blood with 10% moisture content per 1000 pounds of live weight.

The first and second stomachs of cattle are washed, soaked in lime water, and scraped to remove the inside wall. They are then cooked (and sometimes pickled in vinegar) and sold as tripe. The intestines are soaked, slimed, and scrubbed, and used as sausage casings. Casings made from the small intestines are called rounds, the large intestines are called middles or middies, and the blind gut is called the bung. Cleaned casings are cured in fine salt, tied into bundles or hanks, and packed in tierces for sale to sausage makers.

Care of the Beef Carcass

A thorough chilling during the first twenty-four hours is essential, otherwise the carcass may sour at the hip joint—a deep-seated joint from which the heat is slow to escape.

A desirable cooler temperature for chilling warm carcasses is 33° F. Since a group of warm carcasses will raise the temperature of a chill room considerably, it is a good practice to run the temperature of the room down to five degrees below freezing before the carcasses are moved in.

Carcasses of beef must be quartered before they can be handled for shipment. The quarters should be placed in special crimped paper sacks and covered with a stockinet. Great care should always be taken to keep carcasses away from odors or unclean places. Truck bodies should be clean and free from odors. The great difficulty in transporting fresh meat on long distance hauls is the fact that it comes into indirect contact with so many odors before it ultimately reaches the consumer that it very often loses its identity as far as flavor is concerned. Meat is very sus-

The Department of Health of Hawaii reports fifty two slaughter houses and twenty nine meat packing and processing organizations in operation. Fifty per cent of the beef consumed is imported, primarily from the mainland. One of the largest cattle spreads in the world is located in the Kohala district in the northwest section of the "Big Isle."

In every 1000 pound steer there is an amount of phosphorus equal to that found in 100 pound bag of superphosphate.

Meat extract made from whale meat has a weaker flavor than beef extract, requiring 20% to 30% more of it to replace beef extract in a formula.

About 25% of the meat consumed is smokehouse processed.

In the armed forces of the United States, the average soldier consumed 257 pounds of meat (excluding lard) in 1940, of which 82 pounds was smokehouse processed (32%).

Sodium hypochlorite (NaOCl) is one of the most effective as well as efficient and economical disinfectants and deodorants for packing house use. It is approved by the Meat Inspection Division (M.I.D.)

The meat inspector examines the cheek meat of cattle for tape worm cysts.

Kosher killed cattle are not stunned.

One ton of carcass beef requires 106 cubic feet of storage space; if boned it requires 80 cubic feet; if boned, compressed and quick frozen it requires only 50 cubic feet of space.

The carcass meat formerly carried by 10 ships requires 3.7 ships to handle if the meat is boneless, 1.6 ships to handle the meat if dehydrated, and only 1 ship to handle if the meat is compressed and dehydrated.

The hides from more than 100,000 cattle are required every year for leather accessories in the sports field.

Meat rationing was instituted on March 29, 1943, and ended November 23, 1945. Meat and livestock controls were removed October 15, 1946.

According to estimates of a tax expert, 114 hidden tax levies can be traced directly to the various ingredients of a hamburg sandwich and about 164 federal, state, and local taxes are moulded into a cake of soap.

About 3.5% of the cattle slaughtered in the United States are slaughtered on farms.

Canadians are basically beef and pork eaters with lamb accounting for less than two per cent of the total meat con-

Fig. 5.28—Rib from the same steer.

ceptible to foreign odors and therefore the ideal marketing set-up is for meat to move directly from the coolers of the packer to a retail meat shop that handles nothing but meat.

Facts Relative to Beef (Domestic and Foreign)

Since cattle gain approximately 2% to 3% of their live weight at a meal, it would be logical to assume that a sales practice of deducting 2½% of the live weight to arrive at a just sales weight would be fair for all concerned. This should eliminate much quibbling over fill and permit cattle to have feed and water at normal times or before them at all times.

There are a number of programs under which the United States has supplied livestock and meat products to nations handicapped by a lack of purchasing power. The two most important of these are Title I sales under Public Law 480, which are paid for in foreign currency; and dollar purchases financed under Section 402 of the Mutual Security Act. Total shipments under Title I through the fiscal years 1955-59 amounted to $80,361,000 and under Section 402 amounted to $60,654,000.

VI.

LAMB SLAUGHTER

The period between 1925 and 1940 witnessed the almost complete elimination of mutton from the diet of the American public. The Agricultural Marketing Service reports show that lamb constitutes over 90% of the ovine meat supply. The marketing of sheep at an early age has eliminated much of the consumer objection to this type of meat because mutton flavor is minimized or is entirely absent in lamb.

Several other factors that have worked toward the elimination of mutton as a block meat have been the consumer demand for (1) smaller cuts, and (2) less fat. Regardless of the greater economy of the larger cuts and the value of fat as a factor in quality, the public has certain tastes and requirements which are not readily changed.

Market Classes and Grades of Slaughter Lamb

- Ewes, Wethers
  - Hothouse—60 pounds down—Extra Fancy, Fancy, Good, Fair, Plain.
  - Spring—90 pounds down—Prime, Choice, Good, Utility, Cull.
  - Lambs
    - Lightweight, 70 pounds down—Prime, Choice, Good, Utility, Cull.
    - Handyweight, 70 to 80 pounds—Prime, Choice, Good, Utility, Cull.
    - Mediumweight, 80 to 90 pounds—Prime, Choice, Good, Utility, Cull.
    - Heavyweight, 90 pounds up—Prime, Choice, Good, Utility, Cull.

Hothouse lambs are rated by epicureans as being the most delectable of the lamb age groups. They are dropped during the months of October, November, December, and January and are

sumption. They favor the leaner meats comparable to the U. S. Good grade and buy bacon by brand more than is the practice in the United States.

Approximate Number of Slaughtering Establishments.[1]

State[2]	Number Under Federal Inspection	Number Not Under Federal Inspection		Total Establishments
		Wholesale	Local	
	Number	Number	Number	Number
New England	19	18	55	92
New York	23	36	80	139
New Jersey	17	10	36	63
Pennsylvania	21	87	217	325
Ohio	29	83	133	245
Indiana	14	33	89	136
Illinois	32	30	73	135
Michigan	4	82	113	199
Wisconsin	17	39	12	50
Minnesota	10	9	24	43
Iowa	21	7	21	49
Missouri	13	25	29	70
North Dakota	2	2	7	11
South Dakota	6	2	9	17
Nebraska	18	11	21	50
Kansas	16	12	33	61
Delaware and Maryland	11	17	39	67
Virginia	9	12	25	46
West Virginia	—	12	20	32
North Carolina	2	33	65	100
South Carolina	1	11	34	46
Georgia	7	33	48	88
Florida	4	26	36	66
Kentucky	7	15	21	46
Tennessee	9	24	38	71
Alabama	4	11	47	62
Mississippi	3	5	21	32
Arkansas	2	12	37	51
Louisiana	2	14	57	73
Oklahoma	3	27	39	69
Texas	22	75	121	218
Montana	4	9	19	32
Idaho	5	9	20	34
Wyoming	1	—	10	11
Colorado	12	12	17	41
New Mexico	—	2	16	18
Arizona	1	9	3	13
Utah	4	10	16	30
Nevada	2	—	4	6
Washington	13	19	56	88
Oregon	9	21	33	63
California	56	53	22	131
U. S.	455	952	1,810	3,217

[1] Includes all plants with an output of 300,000 pounds or more live weight annually.
[2] New England includes Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. The District of Columbia is included in Delaware and Maryland.

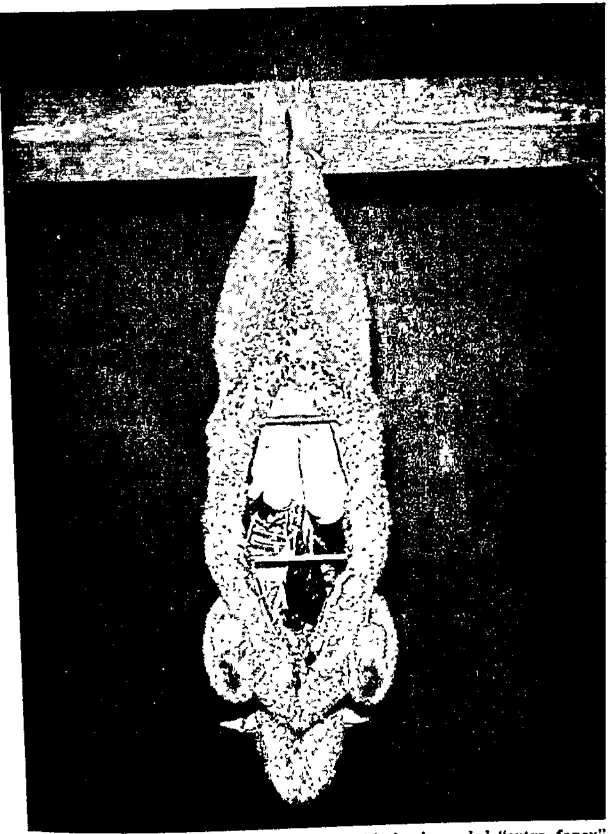


Fig. 6.1—Hot-house lamb (hog dressed). This lamb graded "extra fancy" on the New York City market. It was sired by a purebred Southdown ram and was out of a Hampshire-Dorset-Merino cross-bred ewe. It had an abundance of kidney fat, which is one of the most important factors in judging the finish and determining the grade. Hot-house lambs are dressed "pluck in." The pluck, in this case, consists of the liver, heart, lungs, gullet, and windpipe. This lamb weighed 39 pounds alive and 28 pounds, hog dressed.

marketed between the ages of six to ten weeks. The name "hot-house" is rather ambiguous but its name indicates that these lambs have been housed in barns or sheds where they are protected from the cold weather.

Hothouse lambs may be defined as lambs that are dropped out of the regular lambing season and marketed at live weights ranging from 25 to 60 pounds. This makes the hog dressed weight, which is about 70% of the live weight, range between 18 and 42 pounds. The full dressed weight is 48% to 55% of the live weight. New York City prefers lambs weighing 30 to 40 pounds hog dressed (head and pelt on).

Hothouse lambs are followed by the spring lamb crop from our early lamb producing sections in the Southwest. Both of these groups furnish only a limited quantity of our bulk lamb supply. Lambs born during the regular spring lambing season and marketed the following winter are the chief source of lamb carcass meat. It is during the summer months that the supply of yearling mutton is heaviest, and they help to fill in the period when lambs are rather scarce. A yearling for slaughter purposes is a ewe or wether between 15 and 20 months of age. Over 20 months of age, all sheep are classed as mature mutton and it is no longer possible to remove the foot at the break joint. Yearlings are divided into two main weight groups—those under 100 pounds and those over 100 pounds. Rams are classified as yearlings and two year old and over, all weights. The top grade for rams is choice.

GRADE DESCRIPTION

Lambs weighing between 70 and 90 pounds are in greatest demand because they produce carcasses of the weight (35 to 45 pounds) that finds favor with the trade. Light weight mutton is preferred to the heavier weights by the retail trade.

Prime

Lambs to grade prime must have the wide, deep, smooth, compact conformation characteristic of animals of the meat type. Shoulders should be thick and neat, crops full, back broad and thick, and the legs exceptionally plump and low in the twist. Refinement in the head and legs is essential.

The finish must be sufficient to cover the backbone so that it is not noticeable to the touch. This finish must be firm and

Fig. 6.2—A compression stunner. This particular model uses compressed air—no cartridges. Its high velocity blow is effective in painlessly stunning cattle, hogs, and sheep. It is furnished with penetrating or non-penetrating head. The above illustrates the mushroom or non-penetrating type head used for veal and lamb. (Courtesy, Thor Power Tool Co., Aurora, Ill.)

evenly distributed. The show-ring lamb is characteristic of the top segment of this grade.

Choice

Lambs of this grade are slightly deficient to prime lambs in conformation and differ primarily in a more moderate amount of finish. Choice lambs have sufficient quality to satisfy consumer requirements.

Good

This grade includes lambs that are somewhat deficient in meatiness and finish and includes a number of the better animals of the fine wool breed. It represents a grade that produces carcasses that are in demand because of their lack of trimming fat.

Utility

Lambs that are narrow and somewhat rangy, with long legs, high twist, and unsymmetrical conformation come in this grade. The backs of these lambs will show a decided prominence of bone, have rough, prominent shoulders, bare ribs and loins, and show inferior breeding.

Culls

Thin, unsymmetrical, gaunt, leggy, rangy, narrow, long necked, and low quality lambs make up this grade.

DRESSING LAMB

A 24-hour fast previous to slaughter is probably of greater importance with sheep than with other forms of livestock. It not only facilitates the eviscerating process but adds materially to the bright appearance of the carcass. Some claims are made, although not proven, that the removal of the pelt is made easier by a fasting period.

Handling

Never lift a sheep by grasping the fleece as this causes a surface bruise on the carcass. Instead, place one hand under the jaw and the other at the dock and lead the lamb. Grasp a sheep by the leg when catching it.

Tools and Equipment

A 5-inch scimitar boning knife or a thin, well-ground skinning knife is best adapted for the job of pelting a sheep.

Fig. 6.4—Opening the pelt on the back of the hind leg.

A trough-like skinning rack on legs about 18 inches high for holding a sheep on its back is very handy. The trough is 6 inches wide at the bottom with sloping sides 6 inches high. These racks are also used for veal and are called lamb or veal racks. In the absence of a rack, use a table or a platform.

A rack with the top rail 6 feet from the floor upon which to hang the carcass to eviscerate it should be available.

Stunning and Sticking

A sharp blow on top of the poll will stun sheep that do not have horns. The use of the captive bolt with the mushroom head is recommended.

Place the stunned sheep on a table, on a sheep and veal rack, or on a platform. Grasp the jaw with the left hand, insert the knife behind the jaw, blade-edge outward, and draw the knife out

Fig. 6.3—Bleeding the lamb.

Fig 6 5—Disjointing the foot on the hind leg The dotted line across marks the break joint If the foot were removed at this joint, the anchorage of the tendons (A) would be weakened and the legs would have to be tied together at the hocks instead of the tendons

through the pelt. Do not allow the sheep to kick about and get bloody; that is the reason for keeping it off the floor with the head over the edge of the rack or table.

Pelting

With the sheep lying on its back, grasp a fore leg and open the pelt down the front of the leg to the jaw. Do the same on the other fore leg, the two cuts meeting in a point in front of the brisket. Do not skin out the fore legs at this time.

Grasp a hind leg and open it down the back of the leg from the hoof to the bung. The knife should be held fairly flat to the carcass in making the opening in order not to cut the fell or expose the muscle.

Skin out the hind shank and remove the foot at the joint just above the hoof (two full joints from the pastern or mutton joint). Loosen the tendon over the back of the hock and then proceed to skin out the opposite hind leg.

Standing to the rear left side of the sheep, grasp the cut edge of the pelt at the bung and pull, at the same time using the fist of the right hand to fist the pelt loose. Loosen it around the flank, cod or udder area, and then step to the right front side of the sheep and grasp and pull the V-shaped piece of pelt over the brisket. The pelt is then fisted over the belly by turning and pushing the fist against the pelt and not against the carcass.

Take a strong cord and tie the tendons of both hind legs together. Place the right arm between the pelt and the carcass on the belly, so the right hand will extend through to grasp the right hind leg. Grasp the left hind leg with the left hand and lift the carcass to a rack. This facilitates lifting since the burden of weight is on the pelt over the right arm.

Open the pelt down the center of the belly and fist it loose around the side and up the leg. It is safer to fist up the leg than to pull the pelt down the leg. Unless the skin is started right, pulling the pelt down the leg may tear the protective fell and expose the muscle. Sever the bung and pull the pelt from the tail.

The pelt is then fisted over the shoulder and pulled off the back and neck.

Sever the head at the atlas joint. Skin out the head and remove the tongue.

Eviscerating

Make an opening at the cod, insert the first and second fingers to guard the point of the knife, and continue the opening

to the breast. Remove the caul or web fat. Taking a position to the rear of the carcass, cut around and loosen the bung. Assume the original position, insert the thumb and finger and grasp the loose bung. Use the knife to sever the ureters that lead to the kidneys. These are strong and will tear out the kidneys and the kidney fat if they are not cut.

The stomach and intestines are now easily pulled out and the bile duct removed from the liver. Split the chest with a knife or saw and remove the pluck. Packers do not remove the spleen or smelts.

Use a clean damp cloth to wipe any soil from the carcass and wash the blood out of the neck and chest cavity with water.

Fig 6 7—Do not fist forward any further than is necessary to loosen the cod or udder. Note the trough-like skinning rack.

Fig. 6.6—Fisting the belly. After the pelt is pulled from the brisket, the fisting is continued back to the flank.

Fig. 6.9—Fisting. Practically the entire pelt is removed from the carcass by forcing the fist between the pelt and the carcass. The dotted line shows where the carcass is to be opened for evisceration. The pelvis of a sheep is rarely split.

Fig. 6.8—Hoisting. The arm is placed under the fisted pelt along the belly and extended through to grasp a hind leg. By grasping the other leg with the free hand, the lamb is easily hung without undue strain on the operator's back.

Trim all scrag ends off the neck and skewer the fore shank up against the arm. This latter operation plumps the shoulder.

The Intestinal Tract

The liver from a lamb weighs about 1¼ pounds and is equal to veal liver in tenderness. It does not have any mutton taste but is slightly dryer than veal liver.

The small intestines are stripped and cleaned and if free from nodules are used for weiner casings. Violin strings, tennis racket strings, and surgical ligatures are also made from the small intestines.

The endocrine glands are used for manufacturing gland products such as thyroxin, adrenalin, insulin, pituitary extract, and ovarian extract.

On-the-rail dressing is the common practice in all packing houses doing a volume business. Metal spreaders with clamp ends suspended on trolleys are used to hold the lamb in the desired positions for pelting.

Fig 6 9—Fisting Practically the entire pelt is removed from the carcass by forcing the fist between the pelt and the carcass The dotted line shows where the carcass is to be opened for evisceration The pelvis of a sheep is rarely split

Fig. 6.10—Pulling off the web fat.

Pelts

The pelt is rubbed with fine salt to preserve it until the time it is sold. In packing houses, a depilatory paste made of lime and sodium sulphide is spread on the skin side of pelts and the next day the wool can be pulled. The skins are sold to tanners. Wool is the chief by-product of sheep slaughter and ranges from two to eight pounds of pulled wool per head.

The value of a sheep skin for tanning decreases as the value of the wool for spinning and weaving purposes increases.

A common depilatory used on the farm is made by slaking burnt limestone and spreading the fresh paste about ⅛ inch thick over the skin side of the moist pelt. In several days the wool can be pulled.

Yield

Yearlings in prime condition with the proper 24-hour shrink will dress from 55% to 61%.

Fat show lambs average about 2% to 3% lower.

Choice lambs should average 52%, whereas the run of mutton type slaughter lambs in good condition will average 48% as against 40% for the fine wool breeds.

Aging Lamb and Mutton

Lamb and mutton rank with beef in keeping qualities, dependent upon the temperature of the refrigerator and the amount of fat covering the carcass.

Unless a refrigerator is equipped with sterilamps, it is not advisable to age utility and cull carcasses. The higher grades can be aged for several weeks and choice yearling carcasses are best if aged three or four weeks.

Mutton Flavor

The peculiar mutton flavor characteristic of some yearlings and many aged sheep has been ascribed to:

1. Slow dressing—the flesh absorbing the gases formed in the intestinal tract.
2. Improper dressing—allowing the fleece to come in contact with the dressed carcass and soiling it with dung.
3. Age—the absorption of the wool oil by the fat.

To offset the absorption of gases, it is a practice in some countries to force water or air into the intestinal tract through the rectum.

Fig. 6.11—Removing the head at the atlas joint.

The author made a series of interesting tests consisting of the following:

1. A lamb was bled and left hanging with the fleece on for several hours until it was well bloated before it was eviscerated. After aging for seven days under refrigeration, some rib chops were taken from the carcass and broiled. Result—no mutton flavor.

2. A lamb carcass was rubbed with the wool side of the pelt. Result—no mutton flavor.

3. A lamb chop from a carcass previously tested for mutton flavor (which was absent) was suspended in a jar that was then filled with gas drawn from the rumen of another carcass. The chop remained in the gas-filled jar for 12 hours. Result—no mutton flavor.

4. A similar chop was rubbed with extracted wool oil. Result—an objectionable flavor but different from the characteristic mutton flavor.

5. A rib chop from each of ten aged Merino ewes was broiled. No mutton flavor (likewise no fat).

6. The fat from three fat yearling show wethers was fried. Result—no mutton flavor; in fact, it tasted somewhat similar to bacon fat.

7. The writer was served two lamb chops in a restaurant. Result—mutton flavor and no way to tell what caused it.

Facts About Lamb

Lamb is the most easily digested of our commercial meats and therefore finds wide use in the diet of convalescents.

There is less religious prejudice against lamb and mutton than any other meat except fish.

The flesh of goats is called "chevon."

The fat surrounding the paunch and intestines of sheep is called the "web" or "caul" fat.

About 30% of a good lamb or mutton carcass is in the leg.

Fewer lamb and mutton carcasses are condemned by the meat inspectors than any other class of livestock.

New Zealanders consume more lamb and mutton than any other people.

The size and keeping quality of a lamb carcass make it a very suitable source of farm meat.

A common practice in some markets is to drape the web fat over the front of the hind legs.

"Hog dressed" means to dress with head and pelt on but feet and viscera removed. The object of this method of dressing is to hold down shrinkage and thus aid in maintaining pink color of baby lamb.

Hot-house lambs are dressed "pluck-in," packed in barrels or bundles, and shipped by express or truck to large metropolitan centers where a demand for this specialized product exists.

Hot-house lambs are now sold on a per cent basis. Before World War II, they were sold by the carcass and not by the pound. Choice to fancy grades averaged between $8 and $10 per head, the higher prices being realized on 30- to 40-pound carcasses for the Christmas market.

The condition in hot-house lamb is based on the amount and covering of kidney fat. A short, thick, compact lamb with kidneys entirely covered with white fat will grade as extra fancy, which is the top grade in this class.

The record receipt of sheep in one day on the Chicago market was 71,792 on Oct. 16, 1911.

The United States imports about five million pounds of sheep casings annually and eleven million pounds of other natural casings.

The record year (1943) for sheep and lamb slaughter (inspected, non-inspected and farm) was a total of 27,070,000 head.

The dressed yield for sheep and lambs in the United States (inspected, non-inspected and farm) averages 47%.

California and Arizona spring lambs reach the eastern market during April, May, and June.

About 3.75 pounds of grease wool is required to make one pound of woolen cloth.

Pulled wools constitute about one-seventh of all the wool produced in the United States.

Sheep skins from which the wool has been pulled sell from $3 to $6 per dozen. The skins of long wooled sheep supply the best wearing leather, Merino the poorest.

Goat skins are more valuable than sheep skins because they are larger and wear better.

A great deal of sheep skin is used for book binding, hat sweat bands, shoe linings, gloves, and chamois skins.

A "hoggett," a "haggerel," a "lamb hog," or "tup hog" (if castrated—a "wether hog") are terms applied to a male lamb from weaning time until shorn.

"Haggis' is a Scottish food made from hearts, lungs and livers of sheep or calves, highly seasoned, mixed with oatmeal and boiled in a sheep stomach.

The small intestines from 11 sheep are needed to supply the gut strings for a tennis racket.

About 2% of the lambs slaughtered in the United States are slaughtered on farms.

VII.

VEAL AND CALF SLAUGHTER

Considerable confusion is evident in circles outside the livestock industry as to the distinction that exists between a vealer and a calf. The United States Department of Agriculture defines a vealer as an immature bovine animal usually not over 3 months of age. A calf is defined as an immature bovine animal which for a considerable period of time has subsisted in part or entirely on feeds other than milk.

Since it is rather difficult to determine the age of a vealer or calf, no set age can be given as a definite dividing line. Weight and conformation are used more as a basis for determining their classification, with weight being the determining price factor among vealers and calves of equal conformation, finish, and quality.

VEALERS

There is no sex classification made for vealers since they are not old enough for sex conditions to have had any influence on their physical characteristics. They are sold on the market for slaughter purposes only. The greatest supply of vealers comes from dairy farms during the spring and fall months. The large market centers for veal are New York City, Buffalo, Chicago, Detroit, Milwaukee, and South St. Paul.

MARKET WEIGHTS AND GRADES OF VEALERS

Lightweight, 110 pounds and down—Choice, Good, Standard, Utility, Cull.

Mediumweight, 110 to 180 pounds—Prime, Choice, Good, Standard, Utility, Cull.

Heavyweight, 180 pounds up—Prime, Choice, Good, Standard.

Prime Grade

Vealers of this grade are usually crossbred or high grade animals of beef type or exceptional individuals of the dairy breeds. They are smooth, deep, thick, and compact, and the udder or scrotum shows a marked fullness, indicating good condition. Vealers of this grade range from 4 to 8 weeks of age, weigh between 140 and 190 pounds, and dress from 62% to 67%. They are rather scarce on the market.

Choice Grade

Representatives of this grade are quite similar to prime veal in every respect except finish. They are more plentiful on the market than prime veal and are usually slightly younger. They range in weight from 110 to 140 pounds and dress around 60%. Some beef breeding is represented in this grade, although animals of dairy breeding predominate.

Good Grade

Vealers of this grade are more numerous than the preceding grades and although they must possess a moderately high degree of the qualities of the higher grades, they carry less finish and show more bone and less uniformity. They range between 3 to 6 weeks of age, usually weigh from 110 to 120 pounds, and dress from 55% to 60%. They show mostly dairy breeding.

Standard Grade

A large proportion of the supply of vealers are of this grade and they are largely of dairy-type or scrub breeding. They lack finish, are rather leggy and hippy, rough in the shoulder, and light in the round. The market supply is greatest during April, May, and June. They are relatively young, weigh from 90 to 110 pounds, and dress from 50% to 55%.

Utility Grade

This grade is deficient in every respect, being thin, rangy, and angular. They include a rather wide range of weights (90 to 180 pounds) and individuals may be very fine boned and small, or large boned and coarse. The breeding is very plain and the dressed yield averages 50%.

Cull Grade

Vealers of this grade are extremely rough, rangy and narrow, very deficient in fleshing, and unsuited for producing carcass veal that can be retailed as cuts.

Immature Veal

The practice on many dairy farms which do not have purebred stock is to allow the calf to suckle the dam for several days to remove the colostrum milk. The calf is then sold to a dealer for slaughter or it may be sold to a farmer or dealer who keeps some cows for the purpose of vealing calves. The carcasses of these immature vealers are usually designated as "bob veal." To discourage the sale of immature veal, most states have legislation regulating the legal age at which veal can be slaughtered.

"Vealing" calves refers to the feeding of young calves either by hand or by letting them suckle strange cows, and supplementing the milk ration with a grain gruel. Many calves are vealed by feeding them prepared calf feeds and skim milk. When such feeding has produced calves of the desired weight they are sent to slaughter.

MARKET CLASSES OF SLAUGHTER CALVES

Class	Weight Selection	Grade
Steers, Heifers, Bulls	Lightweight, 200 pounds down	Prime, choice, good, standard, utility, cull.
	Mediumweight, 200 to 300 pounds	Prime, choice, good, standard, utility, cull.
	Heavyweight, 300 pounds up	Prime, choice, good, standard, utility, cull.

Sex conditions have caused some changes in the physical characteristics of calves over 3 months of age that are not evident in vealers, and hence the market classifies calves as to sex. Size and weight are important in the selection of calves, either for slaughter purposes or for further feeding. The prime, choice, and good grades are individuals that show varying degrees of beef breeding, usually being high grade or crossbred calves, and are only offered occasionally at any market for slaughter purposes. They are generally resold as stocker or feeder calves to be grown out and fattened as yearlings or as two-year-olds.

The standard and utility grades are deficient in conformation, finish, and quality and show dairy or scrub breeding. They are numerous throughout the year, especially in the autumn.

METHODS OF DRESSING VEAL

Veal is either dressed with "skin off" or "skin on" (hog dressed). Most markets require the "hog style" carcass because it prevents the outer surface of the carcass from becoming dark and dry. Where carcasses have the skin off, the practice is to remove the skin just before shipment and cover the carcass with muslin or a gelatin dip to keep it from becoming soiled in handling and to preserve the fresh appearance and bloom. Calf carcasses are dressed generally with skin off and split into sides, in the same manner as beef.

Handling, Stunning, and Sticking

Vealers and calves should be kept off feed for 18 hours before slaughter. They should be handled with care to avoid bruises and undue excitement.

Any of the mechanical stunners can be used but the mushroom type head is preferable. Electric stunning works well on calves.

Fig. 7.1—Bleeding (cut-throat).

Fig. 7.2—Fisting the skin from the sides.

Two methods of sticking are common. The one is to "kosher stick" or cut the throat just back of the jaw. The other is to stick in front of the brisket as in the sticking of beef. Since calves struggle for a longer period after sticking than other classes of livestock, it is well to hoist them before sticking. This keeps them clean and makes it easier to skin out the head and fore shanks.

Dressing

Skin off.—The method of opening the skin is the same as in beef. Since a calf skin is thinner and softer and more readily scored or cut than is a beef hide, the better plan is to pull or pound it off the sides and back of the carcass.

Skin on (hog dressed).—The skin is opened from the hoof to the knee on the fore shank and to the hock on the hind shank. Skin out the fore and hind shanks and remove them at the break joint. Skin out the head and remove it at the atlas joint. Split the skin and carcass over the median line of the belly from the back end of the brisket to the cod or udder. Cut around the bung and let it drop into the abdominal cavity. Remove the entrails from the abdominal cavity but leave the liver in the carcass. The gall bladder must be removed from the liver.

Cut the diaphragm and remove the pluck Care must be exercised in this operation in order to keep from mutilating the thymus gland or sweetbreads The sweetbread and liver are considered part of a veal carcass and are weighed with the carcass They are removed in calf carcasses

The caul or stomach fat is draped over the legs (rounds) of the veal carcass if the veal is dressed, skin off

Facts About Veal

There is no age limit set by law on veal slaughtered in Pennsylvania

"Bob" or immature veal, although not unwholesome, is an uneconomical buy because of (1) the high moisture content, (2) the large proportion of bone to lean, and (3) the low quality

The record receipt of calves at Union Stock Yards, Chicago, was 10 673 on Sept 4, 1934

Approximately 11 million calves are slaughtered in the United States each year

The skins from stillborn calves are called "slunk skins" and have a short fine hair Cattlemen have them tanned and made into jackets and vests

The skins from immature or "bob veal" are called "deacon skins" and generally weigh under 9 pounds

The most desirable calf skins weigh from 9 to 15 pounds Those weighing between 15 and 25 pounds are called "kip skins "

Veal consumption in the United States is greatest among the foreign population

A large percentage of gelatin comes from the bones of veal

The largest percentage of veal is slaughtered in packing plants located in large dairy centers

Each state has its own regulations concerning the age at which veal can be slaughtered, ranging from the statement that veal must be wholesome (Pennsylvania) to three, four, six, and eight weeks of age

Veal carcasses are sold either whole or divided into fore and hind saddles Calf carcasses are also split and sold by the side

A veal liver of usual size weighs from three to four pounds and sells for two to three times the price of beef liver.

Sweetbreads of veal are sold either by the pair or by weight.

The heads of veal calves find favor with peoples of foreign extraction who cook them and use the head meat and broth with noodles or as gelled meat.

Fig. 7.3—Pulling the skin from the back.

Number 1 calf skins averaged 72.15 cents per pound and number 1 kip skins 51.37 cents per pound in Chicago during the year 1919.

Because of the high moisture and gelatin content of veal, it finds wide use in a beef, pork, and veal mixture for the making of meat loaf.

Live veal prices in the east are generally a dollar per hundredweight higher than top prices for similar grades in Chicago.

About 4.5% of the calves slaughtered in the United States are slaughtered on farms.

VIII. PACKING HOUSE BY-PRODUCTS

Modern conditions make it almost impossible to cut production and distribution expenses for the majority of commodities; hence, one of the most important opportunities for gaining competitive advantage, or even for enabling an industry or individual business to maintain its position in this new competition, is to reduce its manufacturing expense by creating new credits for products previously unmarketable. From the viewpoint of individual business, this manufacture of by-products has turned waste into such a source of revenue that in many cases the by-products have proved more profitable per pound than the main product, according to Rudolph A. Clemen.

By-products are everything of value produced on the killing floor other than the dressed carcass and are classified as edible and inedible. Livers, hearts, tongues, kidneys, brains, oxtails, sweetbreads, fats, and blood represent the edible by-products, and these along with parts of the carcasses can be converted by manufacture into many other edible products. Far the greatest number of manufactured by-products are made from the inedible by-products and it is in this business that an integration has taken place between packers, subsidiary corporations, and corporations outside of their control.

The greatest percentage return is realized from the by-products of cattle, followed by those from sheep and hogs. Although the per-head money return on hog by-products is low, the large number of hogs slaughtered makes the total sum quite large. Values change as science develops new uses and new products through research.

OLEOMARGARINE (MARGARINE)

The more popular term "margarine" is used in designating the product, and the federal law of 1886, which labeled the product

oleomargarine, was later amended in this respect. The product originally was made exclusively from beef fats known as oleo oils, but the oleo prefix is misleading when applied to today's vegetable margarines.

An Act of Congress passed in 1886 defined oleomargarine as a product of certain well known edible animal fats and coloring matter made in the semblance of butter. Any other wholesome article of food of the manufacturer's choice was permitted to be mixed with these ingredients. A subsequent act passed in 1930 defined oleomargarine as a product of certain animal fats, butter, vegetable fats, fish fats, and coloring matter churned, emulsified, or mixed in cream, milk, or water or other liquid and made in the semblance of butter. Any other wholesome article of food of the manufacturer's choice was permitted to be mixed with any of these ingredients. (As might be supposed, fish fats have never been used in the manufacture of oleomargarine.)

(1) In 1941, margarine was defined by the Food and Drug Administration of the Federal Security Agency under authority of the Food, Drug, and Cosmetic Act of 1938 as a food, plastic in form, which commonly consisted principally of one or more of the following fats: (a) rendered fat obtained from cattle, sheep, swine, or goats, or from two or more of such types of animals, (b) vegetable food fat or oil or both, (c) stearin or oil derived from any such fat or oil. Such ingredients are sometimes hydrogenated.

(2) Oleomargarine sometimes contains a combination of two or more of the vegetable and animal fats named in paragraph (1), and the relative quantities of vegetable and animal fats used affect the properties of the product. Where such a combination is used, the product will retain some of the properties of both the animal and vegetable fats if such fats are present in equal quantities by weight, or if the weight of neither fat exceeds the weight of the other by a ratio greater than 9 to 1.

Milk and Milk Products Permitted to Be Used in Making Margarine

(3) Oleomargarine is made by intimately mixing one of the five following articles with the fat ingredient or ingredients, after such article has been pasteurized and subjected to the action of harmless bacterial starters: (I) cream, (II) milk, (III) skim milk, (IV) any combination of dried skim milk and water in which the weight of the dried skim milk is not less than 10% of the weight

of the water, or (V) any mixture of two or more of these. Congealing is effected, either with or without contact with water, and the congealed mixture is sometimes worked. The word "milk" as here used means cow's milk.

Flavors Permitted to Be Used in Making Margarine

(4) The artificial flavoring diacetyl is sometimes used in oleomargarine to enhance its butter-like flavor. The diacetyl is added as such, or as starter distillate, or is produced during the preparation of the product as a result of the addition of citric acid or harmless citrates. The artificial flavoring augments, and is not in substitution for, the diacetyl which is obtained by the use of bacterial starters in the milk ingredient described in paragraph (3) above.

Well-known Foods Permitted to Be Used in Making Margarine

(5) Butter, salt, and artificial coloring are sometimes used in the preparation of oleomargarine.

Emulsifying Agents Permitted to Be Used in Making Margarine

(6) The following sometimes also are added and are suitable ingredients of the product in the quantities hereinafter stated:

(a) (I) Lecithin, in an amount not exceeding 0.5% of the weight of the finished oleomargarine, for the purpose of aiding emulsification and improving the pan-frying quality of the product, or (II) monoglycerides or diglycerides of fat-forming fatty acids, or both in an amount not exceeding 0.5% of the weight of the finished oleomargarine, for the purpose of aiding emulsification, reducing leakage of moisture from the product, and improving its texture, or (III) such monoglycerides and diglycerides in combination with the sodium sulfo-acetate derivatives thereof in a total amount not exceeding 0.5% of the weight of the finished oleomargarine, for the purpose of aiding emulsification, reducing leakage of moisture from the product, and improving its texture and pan-frying quality, or (IV) a combination of (I) and (II) in which the amount of neither exceeds that above stated, or (V) a combination of (I) and (III) in a total amount not exceeding 0.5% of the weight of the finished product. (The weight of diglycerides in each of ingredients (II), (III), (IV), and (V) is calculated at one-half actual weight.)

Vitamins Permitted to Be Used in Making Margarine

(b) Vitamin A, added as a fish liver oil or as a concentrate of vitamin A from fish liver oil (with any accompanying vitamin D

and with or without added vitamin D concentrate), in such quantity that the finished oleomargarine contains not less than 9,000 United States Pharmacopoeia Units per pound, in order that the oleomargarine, a product used by some consumers for the same purposes as butter, will have a vitamin A content comparable to that of butter, which is, on the average, approximately 9,000 United States Pharmacopoeia Units per pound

Preservatives Permitted to Be Used in Making Margarine

(7) Present conditions of retail distribution of oleomargarine do not afford adequate refrigeration for the product Sodium benzoate, or benzoic acid, or a combination of these, in a quantity not exceeding 0 1% of the weight of the finished product, is therefore sometimes added as a chemical preservative to aid in retarding deterioration of the oleomargarine

Per Cent of Fat Required to Be Used in Making Margarine

(8) The fat content of oleomargarine, including any milk fat used, commonly constitutes not less than 80% of the finished product, and a minimum fat content of 80% is recognized in the industry as proper and desirable

(9) The fat content of oleomargarine can be determined by the method prescribed in *Official Agricultural Chemists*, 4th Edition, page 289, or 5th Edition, page 290, under "Indirect Method—*Official*", and such method is recognized as an accurate and reliable method for determining the fat content of the product

Label Requirements with Respect to Kind of Fats

(10) Consumers are interested in knowing whether the fat used in oleomargarine is animal or vegetable fat or oil Some consumers prefer oleomargarine which is made with vegetable fat or oil, and it is the practice in the industry, where the fat ingredient is wholly vegetable, to so indicate on the label Oleomargarine made from animal fat or oil, if subject to federal inspection, bears the inspection label of the United States Department of Agriculture If a combination of animal and vegetable fats or oils is used and both are declared on the label, consumers assume that the ingredient named first is present in the larger quantity.

Label Requirement as to Presence of Vitamins

(11) Vitamin A, when added to oleomargarine, imparts nutritive properties to the product which are not otherwise present to

an appreciable extent. It is not a universal practice to add vitamin A and consumers are interested in knowing when vitamin A is contained in the product.

The Nutritional Value of Margarine

The composition of modern margarine consists of 80% fat (95% to 97% digestible), 1% milk solids, 15.5% milk moisture, 3% table salt, and .5% ingredients to improve cooking and keeping qualities. It is fortified with 15,000 U.S.P. units per pound (minimum of 9,000) of vitamin A, in some cases 400 to 500 U. S. P. units of vitamin D per pound, supplies 3,300 calories per pound, and has excellent keeping qualities. It is made in modern, scrupulously clean plants under scientific conditions and under federal inspection. The yellow coloring is a certified food color approved by the Pure Food and Drug Administration and is completely neutral and has no effect on the flavor or nutritive value of the margarine.

The Council on Foods and Nutrition of the American Medical Association in its official report stated that "When margarine is fortified with vitamin A, the investigations that have been made lead to the conclusion that it can be substituted for butter in the ordinary diet without any nutritional disadvantage." The Committee on Foods and Nutrition of the National Research Council stated that "Modern margarine is a high quality spread that has no superior in energy content. With vitamin A added, margarine also supplies a protective health element and therein meets the dietary standard of a Basic 7 food." (A Basic 7 food is one the U. S. Government recommends be eaten every day for good nutrition.)

The discovery that mankind requires certain unsaturated fatty acids that cannot be synthesized in the human body led to the recognition of linoleic, linolenic, and archidonic acids (formerly known as vitamin F), and their value in treating people showing fat deficiency disease symptoms. These acids are abundant in the oils and fats used in the manufacture of margarine. Cotton seed oil and soya bean oil which made up 10% and 87% respectively of the oil used in the manufacture of margarine during 1959 contain 43% and 54% linoleic acid in that order. The hydrogenation of the oils (adding a hydrogen atom at the double bonds) changes most of them to saturated fats but still leaves a substantial amount (10% to 15%) in the unsaturated form.

Margarine Restrictions.*

Restrictive Laws	Prohibiting Yellow Margarine		Levying Excise Taxes (per lb.)		Levying Annual License Fees			
	Manufacture	Sale	Yellow	White	Retailers	Wholesalers	Public Eating Places	Manufacturers
California		In public eating places				$50	Restaurants $2 Bdg Houses $2	$100
Colorado								$25
Idaho			10¢	5¢	$5	$25		
Massachusetts					50¢	$25		
Minnesota[1]	Yes	Yes			$3	$3		$3
Montana						$20		$20 and up
Nebraska					$3	$25		$100
New York							Restaurants $10 Bdg Houses $10	
North Carolina						$25		
North Dakota			20¢	10¢	$2 (2 yrs)	$5 (2 yrs)		$10 (2 yrs)
Pennsylvania		In public eating places			$2	$2	Hotels $2 Bdg Houses $2	$2
South Dakota			10¢	10¢				
Utah[2]			10¢	5¢				
Vermont					$2 - $100	$25		
Wisconsin	Yes	Yes		15¢[3]	$25	$500	Hotel or restaurant $25 Bdg Houses $5 Bakery $5 Confectionary $5 Out of-state purchase $1[3]	$1,000
Totals	2	2 2 other states in public eating places	4	5	8	11	4	8

[1] Minnesota has a 10 cent tax on each pound containing less than 65% animal fat and on each pound containing any fats or oils other than animal or milk fats, or peanut, cottonseed or corn oils

[2] Margarine sold and exported to a regular dealer in margarine outside the state is exempt from tax

[3] The 15¢ tax is not applicable to margarine shipped from the state in interstate or foreign commerce, a 6c tax is applicable only to Wisconsin users who purchase outside the state and who must also take out a $1 00 yearly license

*Prohibition of use by state institutions State supported institutions are prohibited from using margarine in Idaho Kansas, Minnesota, North Dakota, Washington, and Wisconsin In addition California, Michigan and Nebraska permit limited use

Butter and Margarine: Consumption and Retail Prices, 1935-59.

Year	Civilian Consumption							Retail Price, per Pound		
	Total		Per Person							
			Butter			Butter and margarine				
	Butter	Margarine	Total	Excluding Donations	Margarine	Total	Excluding Butter Donations	Butter	Margarine	Butter-Margarine Ratio
	Mil. Lb.	Mil. Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Ct.	Ct.	Ratio
Average										
1935-39	2,195	371	17.0	17.0	2.9	19.9	19.9	36.7	18.1	2.0
1947-49	1,533	817	10.6	10.6	5.6	16.2	16.2	79.9	37.7	2.1
1950	1,611	918	10.7	10.7	6.1	16.8	16.8	72.9	32.7	2.2
1951	1,415	990	9.6	9.6	6.6	16.2	16.2	81.9	31.7	2.4
1952	1,318	1,219	8.6	8.6	7.9	16.5	16.5	85.5	29.4	2.9
1953	1,329	1,256	8.5	8.2	8.1	16.6	16.3	79.0	29.4	2.7
1954	1,412	1,316	8.9	8.3	8.5	17.4	16.8	72.4	29.9	2.4
1955	1,461	1,323	9.0	8.3	8.2	17.2	16.5	70.9	28.9	2.5
1956	1,412	1,351	8.7	8.0	8.2	16.9	16.2	72.1	28.9	2.5
1957	1,420	1,416	8.4	8.1	8.6	17.0	16.7	71.3	29.9	2.5
1958	1,439	1,549	8.4	7.7	9.0	17.4	16.7	71.2	29.4	2.5
1959	1,465	1,600	8.4	7.7	9.2	17.6	16.9	74.5	28.5	2.6

Margarine: Fats and Oils Used in Manufacture, 1935-59.

Year	Vegetable Oils						Animal Fats and Oils		Vegetable Stearine[1]	Total[2]
	Soybean Oil	Cottonseed Oil	Peanut Oil	Corn Oil	Coconut Oil	Other	Lard	Beef Fats		
	Mil Lb	Mil Lb	Mil Lb	Mil Lb	Mil Lb	Mil Lb	Mil Lb	Mil Lb	Mil Lb	Mil Lb
Average										
1935-39	32	125	3	1	105	15	2	20	—	303
1947-49	217	402	9	3	9	—	3	7	—	681
1950	312	418	7	1	—	4	4	9	11	764
1951	173	334	16	4	1	2	4	7	11	851
1952	652	354	3	[3]	—	—	5	8	24	1,046
1953	726	275	2	1	7	2	8	13	12	1,049
1954	665	397	2	[3]	5	1	7	10	17	1,106
1955	740	278	2	[3]	6	1	13	9	16	1,075
1956	752	283	3	1	8	1	31	6	24	1,111
1957	871	237	3	[3]	5	3	25	9	24	1,182
1958	1,070	143	4	1	4	3	16	8	19	1,270
1959	1,091	124	4	17	1	10	36	8	7	1,293

[1]Most of the vegetable stearine used in margarine prior to 1950 was included with the primary oil
[2]Includes 2 million pounds of secondary oils other than vegetable stearine in 1952, 3 million in 1953, 1954, 1955, and 1956, and 2 million in 1957 and 1958
[3]Less than 500 000 pounds

Noteworthy facts brought out in the statistics on the amount of fats and oils used in the manufacture of margarine are (1) the tremendous increase in the use of soybean oil, (2) the corresponding reduction of cottonseed oil, and (3) the appreciable increase in the use of lard. A bushel of soybeans yields about 11 pounds of oil.

Per Capita Consumption (1959)	Butter lbs.	Margarine lbs.
Canada	18.0	8.7
United States	8.4	9.2

GLAND EXTRACTS

Scattered through various parts of the animal body are a number of internally secreting, ductless, or endocrine glands. The substance secreted by each exercises some specific control over the conduct, character, and development of the body. Their functions are so interrelated that under- or over-secretion of any one or several of the glands will cause abnormalities. The activating principle is a secretion termed a hormone.

Thyroid

The thyroid gland is located on either side of the windpipe below the larynx and is dark purple in color. It is smaller in cattle than in humans and its secretion is an iodine-containing compound termed "thyroxin." A deficiency of thyroid tissue in the young produces cretins which are young that are physically and mentally defective; in the adult it causes a condition known as "myxedema." A deficiency of iodine in the diet or water supply may cause a *simple goitre. Goitre in humans and animals can be* treated by supplying the necessary iodine. Over-secretion of the thyroid increases basal metabolism causing the afflicted to become nervous and thin. The action of thyroid secretions is interrelated with other glands.

The dessicated thyroid is used extensively in keeping hypothyroid patients from the slow-moving, slow-talking, inactive existence they would otherwise lead. It is one of the few glandular substances that is effective when taken orally. It requires 40 beef thyroids to make a pound (½ to ¾ ounce per gland). Hog thyroids are equally valuable. Thyroids are handled very similarly to pancreas.

Parathyroids

These consist of four small glands, the size of a grain of wheat, which are located close to the thyroid gland. Their secretions regulate the lime content of the blood stream and maintain the tone of the nervous system. The complete removal of the parathyroids causes death within a few weeks. To secure one pound of parathyroid extract requires the slaughter of approximately 3,600 animals. It requires two thousand parathyroid glands to make a pound. The use of a potent parathyroid extract enables patients lacking parathyroid secretion to keep alive.

Pituitary

Located at the base of the brain and well protected in a separate bone cavity, the pituitary gland is about the size of a pea and is grayish yellow in color. It is made up of an anterior and posterior lobe which have distinct functions. The *anterior lobe* is known to produce (1) the growth promoting hormone, (2) the thyroid stimulating hormone, (3) the mammary stimulating hormone or prolactin, (4) the gonad stimulating hormone, and (5) the adrenal cortex stimulating hormone. The *posterior lobe* exerts principles that (1) control blood pressure and pulse rate, (2) regulate the contractile organs of the body, and (3) govern energy metabolism. To secure one pound of posterior pituitary extract requires the slaughter of approximately 11,000 animals. Two hundred and fifty pituitary glands make a pound.

Pineal

This gland is about one-third the size of the pituitary, is reddish in color, and is located in a brain cavity behind and just above the pituitary. Its secretion regulates child growth—hastening or retarding puberty and maturity.

Adrenals

The adrenals are also called the suprarenal glands and are two in number. They are located astride the kidneys in humans but to one side of the kidneys in cattle, and are larger than most endocrine glands. They are reddish brown in color and are somewhat bean-shaped. The cortex (outer portion) produces secretions essential to life maintenance, a lack of these secretions causing Addison's disease. The medulla (inner portion) of the gland produces a substance that constricts the blood vessels and increases heart action. The valuable drug epinephrin is secured

from the adrenals and is used in surgical operations to arrest hemorrhage and stimulate heart action. It requires the adrenals of 13,000 head of cattle to produce one pound of epinephrin. Thirty beef adrenals make a pound.

Thymus

This gland has a commercial food value in the case of the veal thymus. It is cream in color and is located in the neck near the chest cavity. In the case of veal it has two lobes, the second lying within the chest cavity. The thymus functions primarily in youth in inhibiting the activity of the sex glands. It atrophies after the age of puberty.

Pancreas

The pancreas is more commonly known as the sweetbread but should not be confused with the commercial sweetbreads of veal (thymus gland). The pancreas has both internal and external secretions, the latter passing into the small intestines to effect the digestion of starch, protein, and fat. The internal secretion (insulin) regulates sugar metabolism. Failure of the pancreas to regulate this sugar metabolism results in the affliction known as diabetes.

Insulin, first isolated by Doctors Banting and Best, is secured from specialized groups of cells in the pancreas known as the Islands of Langerhans, and is used extensively in treating diabetes. Other extracts made from the pancreas, such as pancreatin, are used as a remedy for intestinal disorders.

A great need for insulin has developed throughout the world and the supply which has never been too great will fail to take care of the increase of diabetes. It takes 20 pounds of pancreas or the glands from 40 beeves to make sufficient insulin to treat a diabetic for one year.

The following specifications for the collection and subsequent handling of pancreas for insulin manufacture are those of Eli Lilly & Co., Indianapolis.

Grade "A"

1. Glands

(a) Pancreas glands are to be taken from healthy animals. The beef and calf pancreas gland is located in the ruffle fat and lies attached to the gut close to the liver. The pork pancreas is located between the small and large intestine imbedded in the ruffle fat.

(b) Calf pancreas glands are those taken from calves not over six months old.

2. **Collection, Trimming, and Delivery to Freezer**

(a) Glands are to be plucked from the viscera as soon as possible. Avoid long exposure to water spray.

(b) Glands should be collected in small buckets, perforated to permit drainage; or in small buckets surrounded with cracked ice. The glands should never be allowed to stand in water or directly in contact with ice. Water may dissolve the insulin in the glands.

(c) Glands are to be clean and trimmed closely, with all surface fat and connective tissue removed. Particular care should be taken in removing fat from pork pancreas; this is best done by stripping with the fingers. It is important with all pancreas, particularly beef and calf, that all of the tail of the gland be saved as *this portion is richest in insulin.*

(d) Glands are to be trimmed promptly and delivered *directly* to the sharp freezer. Not more than one hour should elapse between removal of gland from viscera and placing on tray in the freezer.

(e) It is important in all of the above operations that glands be handled in batches in order of removal from viscera so that each gland will be frozen in minimum time.

3. **Freezing**

(a) Spread glands promptly on clean, prechilled trays in the freezing chamber at the lowest available temperature, 0°F. or less if available, but not higher than 15°F. in any case.

(b) Freeze glands *individually* so that no two glands touch.

(c) Within forty-eight hours after freezing hard, glands should be removed from trays and either stored in temporary *covered* containers or packed in shipping cases.

Ovaries

Ovarian extract, corpus luteum, and ovarian residue are made from the ovaries of sheep, hogs, and cattle. They contain

estrogenic hormones useful in treating menstrual disorders. It requires the ovaries of approximately 250 cows, 900 hogs, and 3,600 sheep to produce one pound of the finished ovarian product. There are 40 hog ovaries to the pound.

Ox Gall

The gall bladder of the average beef contains about four ounces of gall. The galls are emptied of their bile by slashing and the bile emptied into a barrel in the freezer where it is allowed to freeze. Each day's production is put on top of the previous day's output so the barrel consists of layers of frozen bile. The bile is shipped in the frozen state. Four beef galls yield a pound of bile.

Cortisone has been found to relieve pain by reducing inflammation in joints of sufferers of arthritis. The gall of 100 cattle (25 pounds) is needed to produce sufficient cortisone to treat the average patient for one week. Cortisone is also secured in small quantities from sheep and calves.

Other

Pepsin, a digestive ferment, is secured from the lining of the pyloric end of pig stomachs and is used in medicine as an aid to protein digestion.

Rennin, a digestive ferment, is secured from the fourth stomach of suckling calves and is used extensively as a milk coagulant in cheese making.

Peptones of different kinds are prepared from lean muscle tissue and serve as easily assimilated forms of proteins or as cultural media.

Liver extract finds wide use in treating patients suffering from pernicious anemia.

Thromboplastin, made from the brain of cattle, is used as a blood coagulant in surgery.

BY-PRODUCTS DIGEST

Hides

Hides are distinguished as Packer, Small Packer, and Country hides.

The main subclasses of Packer hides are (1) steers, (2) cows, (3) bulls, and (4) calfskins. The main subclasses of Country hides are (1) heavy, (2) buffs, (3) extremes, (4) bulls, and (5) calfskins.

The principal differences between Packer and Country hides exist in the manner of take off and subsequent handling. Packer hides are uniform in pattern; have a minimum of cuts and scores; are free from dung and have been cured, sorted, and stored under standard conditions. Country hides generally are not uniform in take off (pattern), contain more cuts and scores, and because of various systems of handling by different individuals, they are often undersalted, showing hair slips and maggot infestation. Small packer hides are those from small plants outside of federal inspection but which are more expertly handled and more in line with packer hides.

Bull hides are heavier than steer hides and steer hides are heavier than cow hides. Texas hides make the heaviest sole leather.

Conditions in a hide that depreciate its value are (1) excessive tare in the form of manure or dirt, (2) excessive moisture (green), (3) grub holes, (4) cut throats (kosher killed) due to deep cut in the throat, (5) cuts and scores, and (6) improper cure (hair slips).

Hides rank first in cash value as a by-product of cattle.

When speaking of beef hides, the term "native" means "unbranded."

Skins are the pelts of small animals, wild or domestic, such as calf, sheep, goat, muskrat, fox, mink, etc.

When preparing a salted beef hide for shipment, do not bind it with baling wire. The wire will cause a rust stain which lowers the quality of the leather.

The leather made from beef hides is used for shoe soles, harnesses, belting, etc., but when split to reduce its thickness, it is used for shoe uppers, furniture and automobile upholstering, footballs, and bag and case leather.

"Shoddy" leather is made by grinding waste leather to a pulp and pressing it into solid sheets, either with or without the addition of a binding material.

Considerable hide trimmings are used in the manufacture of gelatin and glue.

Soap

The greatest utilization of tallow and grease has been in soap making.

Hides and Skins: United States Imports and Exports, 1950-59.*

Year	Imports				Exports			
	Calf and Kip	Cattle	Goat and Kid	Sheep and Lamb[1]	Calf	Kid	Cattle	Sheep and Lamb[2]
	1,000 pieces	1,000 pieces	1,000 pieces	1,000 pieces	1,000 pieces	1,000 pieces	1,000 pieces	1,000 pieces
1950	3,218	3,311	11,841	28,130	285	120	402	928
1951	2,190	3,212	32,185	20,948	188	80	372	660
1952	1,628	1,230	29,716	19,325	119	315	1,138	498
1953	1,932	155	31,001	25,049	810	771	2,381	419
1954	1,189	443	25,231	18,770	978	1,589	3,478	583
1955	1,439	344	28,501	20,402	1,844	1,765	5,852	847
1956	1,196	341	27,001	20,793	1,848	1,259	4,910	831
1957	1,365	107	20,202	22,155	2,070	1,220	6,317	1,354
1958	908	417	19,519	23,956	2,353	715	5,308	1,365
1959	1,566	1,025	25,111	32,007	1,444	183	4,096	1,927

[1]Excludes hair sheep and cabretta.
[2]Includes negligible amounts of goat and kid.
*Foreign Agricultural Service. Compiled from reports of U. S. Department of Commerce.

The two main classes of soap are (1) boiled soap and (2) cold or semiboiled soap. The bulk of our soap supply is boiled soap which appears on the market as hard soap (soda base.)

Soft soaps (potash base) are made by the semiboiled method and find wide medical use (green soap). They are more expensive than the soda soaps but they leave fabrics and polished woodwork surfaces in a less harsh condition.

The glycerin remains in cold or semiboiled soaps but is a separate and important by-product in the making of boiled soap. It is in the form of a syrupy red liquid which is freed from the fat and settles to the bottom of the kettle during the soap making operation. Glycerin is purified by distillation and one of its uses is in the medical profession as a vehicle for certain medicines to be applied externally. It also finds wide use in the manufacture of nitroglycerin and other high explosives. 100 pounds of animal fat will yield sufficient glycerin to make 24½ pounds of nitroglycerin.

Raw materials for the manufacture of soap are (1) animal—lard oil and tallow, and (2) vegetable oils—coconut, olive, corn, palm, palm kernel, cottonseed, peanut, linseed, rapeseed, and sesame.

Other greases used for making cheap grades of soap for special purposes are extracted from garbage, wool scourings, bone boiling, glue making, and hide trimmings. The garbage grease is changed into fatty acid and distilled, resulting in a very white fat of good odor and used by practically all large soap manufacturers.

Fats, composed of fatty acids combined with glycerin, will unite with the elements sodium and potash hydroxide to form soap, glycerin and water. A pure soap (regardless of the fat used) is a neutral soap where there is an exact balance between the fat and the alkali used.

Boiled soaps appear on the market as milled soaps, framed soaps, or in the form of chips, flakes, powder, etc. Toilet soaps are examples of scented milled soaps; chips, flake, and powder soaps are the unpressed milled soaps, and bar laundry soaps are examples of framed soaps.

Floating soaps contain many minute air bubbles that make them lighter than water but with a 15% to 20% higher moisture content than milled soaps. "Cleanser" is a mixture of soap, alkaline salts, and mineral abrasive.

Washing powder is a mixture of pulverized soaps containing a large amount of filler, usually soda ash.

Dry-cleaning soaps are partially saponified lime soaps dispersed in organic solvents, insoluble in water but soluble in gasoline, benzine, naphtha, etc.

Soft soaps contain about 50% water.

Efficiency of soaps for certain purposes is increased by the addition of fillers, either alkaline salts such as soda, ash, sal soda, or trisodium phosphate, or inert fillers such as talc, starch, and clay. The alkaline salts act as water softeners and detergents.

Soap production has declined some two billion pounds since 1947, due primarily to the increased use of detergent powders and liquids.

New uses for animal fats have been and are being discovered by our scientists. One of these uses has been as a supplement in animal foods.

Glue and Gelatin

Both glue and gelatin are colloidal proteins. They are chemically and physically similar and differ mainly in that gelatin is made from clean, sweet materials prepared under sanitary conditions to make it edible.

The raw materials used to produce gelatin and glue are high in collagen. They are connective tissue, skin or hide trimmings, sinews, horn piths, lips, ear tubes, pizzles, cartilage, beef and calf bones, mammary glands, heads of cattle, calves, and sheep, and knuckles and feet. Pig skins are a good source of gelatin.

Gelatin and Glue Stocks

The three main types of glue are hide glue, bone glue, and blood albumin glue. The latter is water resistant and is used widely in the manufacture of plywood.

The oldest and widest use for glue is in the furniture and veneer industry. Glue has so many varied uses that it has been said that glue holds the world together. It is used in sizing paper; in the manufacture of wool, silk, and other fabrics; in sizing straw hats; in sizing walls that are to be painted; in sizing barrels or casks that are to contain liquids; on the heads of matches to make an air tight cap over the phosphorus; in the manufacture of sand and emery paper to hold the abrasive on the paper; in the manufacture of dolls, toys, and ornaments; in the making of picture frames, mirror frames, rosettes, billiard balls, composition cork, imitation hard rubber, printing rolls, mother of pearl, gummed tape, paper boxes, kalsomine, automobile bodies, caskets, leather goods, bookbinding, and many other products.

The two types of gelatin according to their source are hide gelatin and bone gelatin.

Gelatin finds wide use in the manufacture of ice cream, in the making of certain pharmaceutical preparations and capsules for medicine, for coating pills, in making mayonnaise dressings, and emulsion flavors, to clarify wine, beer, and vinegar, in making court plaster, in photography, in electroplating, as a bacteria culture medium, and for various other uses.

Blood

Blood contains around 17% ammonia of which 14% is nitrogen. If the blood is allowed to coagulate, the jelly-like fibrin (hemoglobin) is cooked and dried, and the residue is pressed into cakes. The cakes are finely ground and disposed of as blood meal or mixed with low grade tankage for stock feed. When mixed with potash or phosphoric acid, blood makes a very rich fertilizer. The serum is clarified and dried and sold as blood albumin.

One hundred pounds of beef blood treated with an anticoagulant and centrifuged will yield about 40 pounds of hemoglobin and 60 pounds of plasma, or 16 pounds of dried hemoglobin, 3.4 pounds of dried serum, and 3.5 pounds of wet fibrin.

Small amounts of the best grades of blood are collected, defibrinated, and the hemoglobin used in making blood sausage. Or the blood may be dried at low temperatures to prevent coagulation of the albumin and the cakes dissolved in warm water and added to liquid sugar to remove the impurities from the sugar.

Blood albumin is used in fixing pigment colors in cloth, in finishing leather, in certain malt extracts, in clarifying liquors, and in the manufacture of glue. Dried blood or blood meal is a very concentrated stock food containing about 87% protein.

Inferior grades of blood are used in the manufacture of buttons and imitation tortoise shell articles. Blood and its products are finding added medicinal and therapeutic uses.

Miscellaneous By-Products

The degreasing of wool removes a wool oil that amounts to about 15% of the weight of the wool treated and produces some valuable products, including lanolin, which are used as bases for ointments and cosmetics, leather dressings, and fiber lubricants.

The potassium carbonate removed in the wash water in wool cleaning represent about 1/4 of the by-product value of degreasing.

A substitute for camel-hair brushes is made from the delicate hairs on the inside of the ears of cattle. Hog bristles for making brushes were formerly imported from China but are now being produced in the United States in increasing amounts. It requires considerable hand labor to collect the proper length hair which is found over the shoulder and back of the hog. The fine hair of the bulk of our domestic hogs is not suitable for brush making and is processed and curled for upholstering purposes.

Pure neats-foot stock is made from the shin bones and feet of cattle. This stock is grained and pressed to secure the pure neats-foot oil which is used in the leather and textile industry.

Edible tallow is made from beef fat not considered suitable for the manufacture of oleomargarine. It is refined and used in lard substitutes.

Inedible tallow and other greases are considered contaminated and are used for making soap and lubricants.

Stick is tankwater collected in evaporators and reduced to the consistency of molasses. It is mixed with tankage and dried.

Most of the residue from packing plants is made into stock food and used to supplement the necessary protein for hog and poultry rations. Very little goes into the manufacture of fertilizer. Dead animals are tanked (steam-pressure cooked) in specially sealed tanks and made into fertilizer.

Shin bones of cattle, with knuckles removed, are cooked to remove the meat and neats-foot oil, and are washed and air dried. They are then sawed into flat slabs from which crochet needles, bone teething rings, pipestems, dice, chessmen, electrical bushings, washers, collar buttons, flat buttons, knife handles, and many other articles are made. Some other uses for bone are in case hardening steel, in the manufacture of bone black used as a bleach for oils, fats, waxes, sugar, or pharmaceutical preparations; as a stock food (ground bone meal, steamed bone meal) and as a fertilizer.

Cattle horns can be split into thin strips, pressed in heated molds of various patterns, and colored to make imitation tortoise shell. Horns are used for making napkin rings, goblets, tobacco boxes, knife and umbrella handles, and many other articles.

White hoofs are used for making imitation ivory products. Black hoofs find use in the manufacture of potassium cyanide for extracting gold.

Dry rendering is used almost exclusively in the manufacture of lard and in the extraction of edible and inedible fats and oils.

The advantage over the wet method (live steam turned into and mixed with the contents of the tank) is that it eliminates the expense of handling tank water, cuts down objectionable odors, produces crackling about 10% richer in protein, produces a grease or tallow low in free fatty acid, is more rapid, and produces a residue that is more suitable for stock food.

HORSE MEAT

The human consumption of horse meat in the United States is very small but its use in the manufacture of pet foods and for export has more than doubled in recent years. The Horse-Meat Act was approved July 24, 1919, making federal inspection necessary for horses slaughtered for interstate or foreign shipment if the meat is to be sold for human consumption. The slaughter establishment must be separate from those slaughtering other animals or where the meat products of other animals are handled. It provides that such meat must be conspicuously labeled, marked, branded, or tagged "Horse-meat" or "Horse-meat Product." Horse meat is also regulated by the Federal Food, Drug and Cosmetic Act, and practically every state has its own regulations.

The average annual export of horse meat for the period 1930-40 was three million pounds as against 41½ million pounds in 1946. The decline in horse population from 21½ million in 1919 to slightly over 3 million in 1959 is making horse meat more difficult to get and will probably cause a rise in its price. During prewar days, the Netherlands took most of the export horse meat but 1946 saw France, Czechoslovakia, Sweden, Poland, Danzig and Austria displace the Netherlands in quantity imported. The horse-meat business is not the highly profitable business it was in the early forties because the cost of the horse has risen to a point where the margins are about the same as in the meat packing industry. The meat is not the only source of revenue. Horse hides are used for leather, tallow for soap, hair, mane and tail for hair goods, the glands for pharmaceuticals, and the edible offal as food for fish or carnivorous animals. Dead horses are converted into oils, glue, and fertilizer.

Horses Slaughtered Under Federal Inspection (1943-1959)

	1943	1944	1945	1946	1947	1948	1949	1950	1951
No.	39,935	60,501	59,674	103,880	276,290	303,974	307,794	275,851	340,287

	1952	1953	1954	1955	1956	1959
No.	357,086	270,533	247,258	196,106	175,537	88,100

United States imports of fresh and cured horse meat from Argentina in 1959 totaled over two and a quarter million pounds and will increase as that country mechanizes its agriculture. The 1958 horse population of Argentina numbered four million head.

IX.

THE PRESERVATION, SMOKING AND STORING OF MEATS

Various methods of preserving meat have been practiced through the ages, the most common of which are drying, smoking, salting, and freezing. The preservation of foods by the use of salt and sugar is accomplished by the simple process of dehydration, in which osmosis withdraws water from the protoplasm of the spoilage organisms, shriveling or inactivating the cells.

Jerked Beef (Jerky, Charqui, or Xarque)

The Spaniards who came to North America during the century following Columbus found dried meat in use by the Indians of what is now southwest United States, Mexico, and Central and South America. The native Indian word used by Chileans and Peruvians for meat cut into long strips and dried quickly in the sun and wind was "charqui" (pronounced sharkey). The Portuguese explorers of Brazil called it xarque and the English adventurers called it "jerky" or "jerked beef."

With a plentiful supply of bison in the southwest, the practice frequently was to use only the eye muscle of the back, from the hump to the rump, and the tenderloin muscle. These muscles were cut into long, thin, flat strips and hung in trees, on poles, or in the tops of huts or tepees out of the reach of dogs. The dried strips, which were very hard and inflexible, were powdered by beating them with stones or wooden mallets and were mixed with dried fruits and vegetables to form "pemmican." In this form the dried meat was transported in skin sacks or bladders and was the principal food whenever the tribes were migrating.

The tongue of the bison was the most highly coveted part of the animal and was given to the man who killed the animal. The meat from the shoulders and hind quarters, which was usually tough, was left behind. The fat from the hump, which resembled bone marrow in flavor, was highly prized.

The intestines of fat bison were removed, turned inside out, and washed at a stream. When cooked crisp, these chitterlings were considered a real delicacy.

Smoking Meat

The preservation of meat in North and South America by smoking was undoubtedly a practice that originated where the meat was dried in the top of a tepee or over the camp fire. The advantage of this type of preservation lay in the fact that the smoke overcame other objectionable flavors that were certain to develop if the drying did not proceed at a rapid rate. The pyroligneous acid in the wood smoke had an added preservative effect on the dried meat. The favorite wood smoke was produced by hickory and oak, although the primitive Indians also used semi-dry grass, sage, and various aromatic seeds and plants.

The drying and smoking of meats was known to the Egyptians as well as to the ancient Sumerian civilization which preceded it.

Salting Meat

Dry salting and pickling meats have been practiced since the fifth century B.C. and possibly longer. Just how dry salting originated is not definitely known. It is quite likely that the use of salt for preserving meat was entirely accidental. Since saltpeter was probably an impurity in the salt that was used, it remained for the chemist to develop this color-retaining agent in its pure state. The salted meats of the ancients were very unevenly cured, and objectionably dry and salty. The latter part of the eighteenth century marked the beginning of the salt curing of meat on a scientific basis.

Virginia Ham (Old Time)

The post civil war period offers some interesting information on the production of Old Virginia Ham. The practice was to kill the pork in November when the points of the new moon were up. This was considered very important and was explained on the basis that if the points of the moon were down, a flat board placed on a plot of grass for a week would wither the grass and be full of worms and grubs whereas if placed there when the points of the moon were up, the grass would grow more luxuriantly and actually lift the board off the ground with no worms or grubs in sight. Therefore if the hams were salted when the

moon points were down, the hams would lose weight, wither, and be unfit to eat.

Fine table salt was rubbed into each ham in one long thorough rubbing. Then the hock end was packed with salt and an extra layer of salt was spread over the entire ham. They were packed in barrels and left to cure for seven weeks in a dry, cool place.

At the end of the seven weeks, the hams were rubbed with a mixture of New Orleans molasses, brown sugar, black pepper, cayenne pepper, and saltpeter. These ingredients were mixed in the following amounts to be rubbed on 100 pounds of ham: ½ pound black pepper, 1 quart of New Orleans molasses, 1 pound of brown sugar, 1 ounce of saltpeter, and 1 ounce of cayenne pepper. The hams to be rubbed were brushed of all visible salt and then rubbed with the mixture and left to lie in a cool room for another two weeks. At the end of this second period they were hung in the meat house with the hocks hanging downward because it was thought that a ham hung by the hock would lose flavor, toughen, and spoil. They were not smoked but were allowed to age for another 30 days.

Virginia Ham (Smithfield)

In 1925, the Virginia State Legislature passed an act wherein Smithfield hams must be processed in Smithfield and come from hogs grown in the peanut belt of Virginia and North Carolina. The hams are sprinkled with saltpeter, using 4 pounds per 1000 pounds of ham, and are then given a rubbing of fine salt. Three to five days later they are given a second rubbing of salt and stacked in a curing room to cure for 1 day per pound of ham. After the cure, they are washed and given a cool smoke (80°-85° F.) for 7 to 10 days, using hickory wood, smothering the blaze with apple wood sawdust. After smoking, they are rubbed with pepper and hung in aging rooms for a period of 7 to 18 months. The shrinkage from green weight is around 25%. The dryness and saltiness of the hams require the consumer to soak them for 24 hours and simmer them for 4 to 6 hours.

Westphalian Hams (German)

This is a ham of distinctive flavor, produced by smoking with juniper twigs and berries over a beechwood fire. The juniper shrub is indigenous to Northwestern Germany and so plentiful, especially in Westphalia, that to its presence is due the

growth, during the past several centuries, of two principal industries of this German province: the distillation of gin and the preparation of hams. According to the most authoritative information obtainable, Westphalian hams (to be sliced and eaten raw) are prepared as follows:

Rub the hams thoroughly with a mixture of 16 pounds of salt and 1 ounce of saltpeter per 100 pounds of pork. Place them on shelves or stack them on concrete floors and allow them to cure for two weeks, then place them in a 22% brine solution (90° pickle) and allow them to cure 18 more days. At the expiration of this period remove them from the brine and pack them one upon another in a cool dry cellar for four weeks during which time they undergo a ripening process. Then clean them with a stiff brush in lukewarm water and allow them to soak in fresh water for 12 hours.

They are then ready for the smokehouse. Beechwood only is used except that juniper twigs and berries are constantly thrown on the fire. Beechwood sawdust is strewn over the fire in case it becomes too hot. The process continues for a period of seven to eight days.

Scotch Hams

Fresh hams are skinned and most of the fat removed, after which they are boned and given a mild cure according to a formula and practice followed in some parts of Scotland. The cured ham is then rolled and tied and placed in a cellulose casing but is not smoked.

Some Salty Statements

Prior to the advent of artificial refrigeration, salting and canning were the practices employed to preserve meats. Winter freezing freshly killed animals and game was popular.

Refrigeration and zero storage are now the vogue and have replaced salt in large measure as a preservative. The human palate has become more sensitive to salt than it has to nicotine or alcohol. Mildness and brightness (appearance) play a larger role in appetite and sales appeal. Yield is a factor that has become more critical to the processor than in by-gone days when haste and waste were not so important. Speed has become a necessary part of our economy. Fast cures, that are mild, and light smokes have relegated long, heavy cures to the outskirts of civilization. Today, cured meats add variety and a distinctive

flavor to products that must in turn be preserved by refrigeration.

The Curing Ingredients

The most important of the curing ingredients is salt (NaCl). It makes up the bulk of the curing mixture because it is not only a good preservative but it provides the most desirable flavor. Its diffusion in meat is by the process of osmosis. Salt inhibits the growth of bacteria and in some products is more effective in conjunction with nitrite. There are some bacteria, yeasts, and molds that flourish in salt concentrations of various degrees, but salt as a preservative reduces the many to a few.

Sugar, a secondary ingredient in the curing formula, counteracts the astringent quality of the salt, enhances the flavor of the product, and aids in lowering the pH of the cure. Its role in color development and color stability under present commercial curing practices has been found to be negligible.

Other ingredients that are preservatives, but which are used in small amounts and primarily to develop color in the cured products, are sodium nitrate ($NaNO_3$), sodium nitrite ($NaNO_2$), potassium nitrate (KNO_3), and potassium nitrite (KNO_2). The nitrites are the result of bacterial reduction of the nitrates. In long cures, the amount of this reduction may be considerable. A common practice was and still is, in isolated instances, to add some of the old pickle to fresh pickle to introduce the nitrate-reducing bacteria. The difficulty with this method is the lack of control that the processor has over the amount of nitrite formed. Too much nitrite may cause nitrite burn, and too little can result in under-cure. Since the quick-cured meats have insufficient time for the reduction to take place, it has become necessary to use some nitrite in the cure.

The Meat Inspection Division (MID) of the U.S.D.A., under Amendment 4 to B.A.I. Order 211 (revised), specifies the following amounts of nitrite that can be used: Two pounds of nitrite in one hundred gallons of pickle; one ounce of nitrite for each one hundred pounds of dry salt, dry cure, or box cure; and one fourth of an ounce of nitrite in each one hundred pounds of chopped meat or emulsion. The practice is to make up a 100° pickle for stock purposes and then add water to reduce it to the desired salimeter strength. A stock pickle might consist of 260 pounds of salt, 25 pounds of sucrose, 5 pounds of sodium nitrate, and 1 pound of sodium nitrite to each 100 gallons of water.

Myoglobin is the pigment occurring in the muscle which acts as a vehicle for oxygen storage in the muscle. Hemoglobin is the pigment that acts as a carrier of oxygen in the blood. It is the reaction of nitric oxide (NO), a decomposition product of the nitrite, that combines with myoglobin to form nitrosomyoglobin. This is the red color that heat will change to the desired pink color (nitrosohemochrome).

Ascorbic Acid

The time element has posed some problems in color development and retention in cured meats and particularly in emulsion-type products that are heat processed immediately. It was found that ascorbic acid, iso-ascorbic acid, or their salts, hastened color production due to either a chemical reaction with the nitrite, producing more nitric oxide, or by reducing metmyoglobin to myoglobin.

Federal regulations permit the addition of 7½ ounces to 100 gallons of pickle or ¾ ounce to each 100 pounds of sausage meat or emulsion.

Spraying the surface of fresh meats with 5% ascorbic acid has been found to deter color fading caused by light. The ability of ascorbic treated cured meats to resist fading is ascribed to residual ascorbic acid maintaining reducing conditions on the exposed cured meat surface.

Alkaline Phosphates

The primary purpose of alkaline phosphates is to decrease the shrinkage in smoked meat and meat products and the "cook-out" in canned meat products. The ability to increase the water binding quality of meat results in increased yields up to 10%.

Federal regulations restrict the amount of phosphates not to exceed 5% in the finished product. The use of phosphates is not permitted in sausage emulsions. The approved phosphates that can be used in curing primal cuts are sodium tripolyphosphate, sodium hexametaphosphate, sodium acid pyrophosphate, sodium pyrophosphate, and disodium phosphate alone or in combination.

CURING METHODS

Prolonged exposure of meat to salt action results in excessive shrinkage and high salt content. It is therefore important in

any of these methods that quantitative measurements and time schedules be observed.

Dry Salt Cure

The dry salt cure was the original method employed by our ancestors who practically had to pick the salt out of their teeth. It involved the rubbing and packing of meat in salt for considerable periods of time. The only use made of this method today is in the production of salt pork where fat backs, heavy jowls, and occasionally heavy sow bellies are packed or rubbed with dry salt. Salt pork finds favor in the south where it is used as "seasoning meat" with greens. It is well to add ten ounces of saltpeter to each 100 pounds of salt and use 10 pounds of cure per 100 pounds of pork as it is layered. Allow it to cure for two to eight weeks.

Dry Sugar Cure

The dry sugar cure has proven to be the safest method for farmers and operators who do not have refrigerated curing rooms or the equipment for injection curing. Its chief advantages are that (1) the rate of cure is more rapid than the immersion cure because the curing ingredients are applied directly to the meat surface in their full concentration; (2) the curing can be conducted safely at higher and wider temperature variations than is possible in immersion curing; (3) the time schedule is not exacting; and (4) there is less spoilage in the hands of the novice or under unfavorable curing conditions. A simple and time tested formula consists of mixing 8 pounds of table or curing salt, 3 pounds of cane sugar, 3 ounces of saltpeter, and ½ ounce of sodium or potassium nitrite or a total of 4 ounces of the nitrate (saltpeter) if the nitrite is not available.

Use one ounce of the cure for each pound of pork. This will require three separate rubbings for hams at 3 to 5 day intervals; two rubbings for picnics and butts; and one thorough rubbing for bacon, with a light sprinkling over the flesh side of each bacon after it is rubbed. For heavy hams (over 20 pounds), use 1½ ounces of cure per pound of ham, or four rubbings. Place the rubbed meats in boxes, on shelves, or on wooden tables to cure but do not place them in tight boxes or barrels where they will rest in their own brine.

The length of the curing period is *seven days per inch of thickness*. Since most hams weighing 12 to 15 pounds measure

five inches through the cushion, they will cure in 35 days; a bacon two inches thick will cure in 14 days. If the cured cuts remain in cure for a longer period of time, they cannot become any saltier and that makes it possible to smoke them all at the same time.

If some salt is forced into the aitchbone joint to guard against bone souring, the curing can be done at higher temperatures and in a shorter time. This is because salt absorption is more rapid at the higher temperatures.

Box Curing (Pressure)

The pressure method of box curing is applicable only to bacon. It is practiced by packers who produce a mild cured product. The amount of cure used is about ¾ of an ounce to each pound of bacon. Tight boxes and in many cases ordinary curing vats are used. The size of the box should be such that the bacon will fit in snugly without overlapping regardless of the number of rows. A lid fits loosely inside the box or vat, upon which considerable pressure can be exerted either by a dead weight or a screw jack on a crossbar attached to the sides of the container.

The pressure on the bacon causes the brine that is formed to rise to the top and cover the meat, thereby sealing it from the air. With just the right amount of cure having been added, the length of time to cure the bacon is of minor concern because it cannot become too salty. Packers have used this method of curing bacon as a means of storage, allowing it to remain in cure as long as 90 days.

The Hot Salt Cure

A practice followed in some communities and tested at the Pennsylvania Experiment Station with success is as follows:

Rub the cushion side and butt of the ham with saltpeter (1 ounce). Follow immediately with a rubbing of granulated or brown sugar over the entire ham. Allow the ham to absorb these ingredients for several hours before applying the hot salt. Heat sufficient salt so it is uncomfortable to the hands (wear cotton gloves). Place the ham in the hot salt and cover for five minutes to get the ham in a soft condition. Take a clean, round, pencil-size stick and force the hot salt into the aitchbone joint. Give the ham a thorough rubbing with the hot salt. An accurate measure would be an increase in weight of ¾ of an ounce per pound of ham.

Allow the hams to absorb the cure for five to seven days; rub with black pepper and smoke.

The Sweet Pickle Cure

A combination of salt and water is called a brine or pickle. A brine that has preservative qualities, such as sodium chloride (common salt) and water, is used for curing meat. The addition of sugar to a sodium chloride brine is called a sweet pickle. The proportion of salt to water determines the strength or salinity of brine or pickle. In the meat industry, two different types of brine are common—the pickling brines and the refrigerating brines. The latter is a combination of calcium chloride and water and is used to carry cold to refrigerated boxes operating under the indirect expansion system. In no instance is calcium chloride brine used as a pickle.

Sweet pickle with a salimeter reading of 75° to 85° is recommended for farm curing. The Sweet Pickle Table gives the amounts of the different ingredients and the water necessary to make such pickles. If the nitrite is available, reduce the amount of saltpeter (nitrate) to 3 ounces and add ½ ounce of sodium or potassium nitrite. A good practice to follow is to heat the water to the boiling point and dissolve the ingredients in it. Allow the pickle to chill before pouring it over the meat. A salimeter is a necessary piece of equipment when making up curing solutions of different salinities.

Containers

Cypress curing vats, clean molasses or vinegar barrels, or large stone crocks make suitable curing receptacles. A clean lid and a stone for a weight are necessary. Barrels in which any sort of spray material has been mixed must never be used. Metal containers that will corrode are unthinkable.

Temperature

The best temperature for the curing room is from 35° F. to 40° F. Unless curing vessels have been previously contaminated with ham souring bacteria, very little spoilage is experienced at these temperatures. Successful sweet pickle curing can be done at temperatures ranging from 40° F. to 50° F., which is the usual cellar temperature on farms during the winter. Temperatures of 50° F. and over are too high for safe pickle curing. The brine

will sour and become ropy and the hams will develop an off-flavor or will sour around the bone.

Length of Cure

Hams should be measured through the cushion back of the aitchbone to determine their thickness. All hams measuring the greatest thickness should be placed in the bottom of the vat with the lighter hams placed on top. A record of the thickness of each layer should be recorded on a card or in a book so that the date when they are to be taken out can be determined. The following is the curing schedule for the different strengths of sweet pickle:

85° pickle cure	9 days per inch
75° pickle cure	11 days per inch
60° pickle cure	13 days per inch

Procedure on the Farm

Pack the chilled hams, shoulders, and bacon in the barrel or vat in the order named and pour sufficient cold pickle over the pack so it will be covered when the lid is weighted down. Four gallons of pickle will cover 100 pounds of closely packed meat, but 4½ to 5 gallons are necessary if loosely packed. Overhauling meat once or twice during the curing period is desirable to permit the pickle to reach all parts of the meat.

It is necessary to follow rather closely the length of cure prescribed for the different strengths of pickle. As an example, consider a barrel of pork consisting of hams 5½ inches thick, on top of which are shoulders 3½ inches thick, over which are bacons 2 inches thick, curing in an 85° pickle. According to the schedule of 9 days per inch in cure the bacons must come out in 18 days, the shoulders in 30 days, and the hams in 50 days. If 5 gallons of water are used to dissolve the 8-3-3 formula, making a 75° pickle, it will be necessary to cure at the rate of 11 days per inch. A 75° pickle is preferable if the curing room temperature does not rise to over 45° F.

A large part of the pork spoilage occurring on the farm could be eliminated if from 4 to 8 ounces of pickle were pumped into the center of the ham and around the hip joint soon after slaughter. A good syringe-type pickle pump will cost from $15 to $18.

Shrinkage

There is very little difference in the shrinkage of pork cured by the dry and sweet pickle methods at the end of a 60-day aging

period. Sweet pickle cured hams will gain an average of 5% in cure as compared to a loss of 5% to 7% for hams in dry cure. Sweet pickle hams lose about 5% during smoking as compared to 2% for dry cured hams. Bacon will show about 5% higher shrink than hams because of the large surface area.

Soaking

All farm cured pork, whether dry or sweet pickle cured, should be rinsed or soaked in cold water before it is placed in smoke. The soaking removes the excess salt on the outside and eliminates the formation of salt streaks on the meat when exposed to the heat of the smokehouse. Quick cured meats are rinsed but not soaked.

Soaking pickled bacon and shoulders one hour and ham about two hours is sufficient for farm purposes. Dry sugar cured meats cured with 1 ounce of the cure per pound of meat need not be soaked. Rinsing is sufficient.

Sweet Pickle Table.

Formula			Cold Water		Degree of Pickle by Salimeter 40° F.
Pounds Salt	Pounds Sugar	Ounces Saltpeter	Gallons	Pounds	
10	3	4	4	33⅓	95°
9	3	4	4	33⅓	90°
10	3	4	5	41⅔	85°
8	3	4	4	33⅓	85°
8	3	4	5	41⅔	75°
6	3	4	4	33⅓	70°
7	3	4	5	41⅔	65°
6	3	4	5	41⅔	60°

Cold water weighs 8.33 pounds per gallon hot water 8 pounds per gallon
Seven pints of salt weigh 8 pounds
One quart of syrup weighs 3 pounds
Federal law limits the use of saltpeter to 10 pounds per 100 gallons of water If salimeter is calibrated for reading at 60° F substract 1.16 per degree below 60°

Curing Terms Defined

Pumping.—The forcible introduction of pickle into a ham by means of a ham pump.

Stitch or Gun.—A single insertion of the needle in the pump method. The number of stitches or guns given each ham varies with the size of the ham and the strength of the pump pickle. They range from 2 to 6 per ham, running from 2 to 4 ounces of cure per stitch.

Cover pickle.—The pickle in which hams cure.

Salimeter (salometer or salinometer).—A ballasted glass vacuum tube graduated in degrees and used for testing the strength or salinity of pickle.

Overhaul.—The rehandling or repacking of ham during the pickling period to permit a more uniform distribution of pickle.

Quick cure.—A term applied to a pickle containing sodium nitrite or a combination of nitrite and nitrate.

Immersion cure.—Curing in a cover pickle.

Injection cure.—Stitch pumping or needling.

Artery cure.—Injection of cure into femoral artery of ham and artery in the shoulder.

The Combination Cure

A successful method of curing hams on the farm is the use of the dry cure and the sweet pickle cure in combination. The quicker the salt gets to the center of the ham, the less danger there is of loss from spoilage. Experiments show that where 1½ to 2 pounds of salt per 100 pounds of pork is rubbed into hams 24 to 48 hours before they are placed in a 75° pickle, they will cure in 9 days per inch. This one rubbing of salt is all absorbed overnight and has more rapid penetrating qualities because it is not mixed with other ingredients or dissolved in water.

Pump Pickling (Stitch or Spray Pumping)

To hasten the introduction of the cure to the center of the ham, processors can use the practice known as pumping. This consists of forcing the curing pickle into the center of the ham through a needle attached to a plunger-type syringe or by means of mechanically operated pumps. Pumping pickle may be the same strength as the cover pickle although a 5° to 10° stronger pickle is generally used. The curing of a ham is hastened considerably under this method as it takes place from the inside as well as from the outside. Hams should not be stitch pumped with more than 8% of their weight of 85° pickle. That would mean that 1½ pounds of 85° pickle is pumped into a 20-pound ham and the ham is then cured in a 75° pickle 7 days per inch, or 2½ day per pound of ham. (This shortens the cure 4 days per inch.)

When using a 70° to 75° pickle, stitch pump the ham with 10% and cure in 75° pickle 9 days per inch of thickness.

Hams have been cured very successfully, experimentally, by using a combination of pumping and dry curing. The procedure

Fig 9 1—Giving the ham a stitch at the hip joint (pump pickling) Give remaining stitches in cushion, stifle joint, hock end, and butt end.

is to use an 85° pickle at the rate of 8% of the weight of the ham and then rub with one-half its usual application or one-half ounce of the recommended formula per pound of ham and cure it 2½ days per pound.

Advantages of Pump Pickling

(1) The salt is introduced to the center of the ham before spoilage has a chance to take place.

(2) The curing period is shortened almost one-third.

(3) A quicker turnover is effected.

The Artery Cure

Artery curing consists of forcing a pickle into the femoral artery on the inside butt end of the ham by means of a small needle attached to a hose and connected to a pump that exerts a pressure of 40 to 50 pounds. The artery-pumped hams are either rubbed with the dry mix or placed in a pickle of similar strength for 5 to 7 days to complete the curing. The salinity of the pickle to use will depend upon how long and under what conditions the ham is to be stored. A pickle strength of 60° to 65° on the salimeter is acceptable where hams are to be tenderized and held under refrigeration

Repeated tests, using the formula recommended in this text, produced higher flavor and better keeping quality where hams were artery-pumped with 10% of their weight using a 75° pickle. These artery-pumped hams were given a light rubbing of the dry cure mixture and left to shelf cure for several days before being smoked. These hams had longer storage life and their flavor was more acceptable to the trade than were the hams cured with 60° or 65° pickle. For farm curing, the use of the 85° pickle (10% by weight) and one thorough rubbing of the dry cure produced a ham of high flavor and good holding quality.

The advantages of artery-curing are speed and uniform flavor. It is particularly adapted to pork processors and those doing custom curing. These hams cannot be tenderized if they are to be summer stored but must be smoked at the conventional temperature of 110° to 125° F.

Needled Bacon

A machine, designed with over 100 fine hollow-stemmed needles through which the curing pickle is injected hypodermically into the automatically conveyed bellies, handles about 5000 pounds of bacon per hour. The length of the curing period is reduced from two weeks to two days by this method.

Tenderized Hams

Hams of several degrees of tenderness are produced for the market, any of which require further preparation in the home. The tenderizing occurs in the smokehouse that is thermostatically heat controlled. The cured hams are first soaked in tap water to remove excess outside salt and are then placed in a smokehouse. It takes about 24 hours to tenderize hams and it is usually accomplished in three stages. During the first eight hours or the drying stage, the gas burners or steam (if steam coils are used) heat the house to 125° F. All drafts are opened to carry off excess moisture and there is no smoking during this period. During the next eight hour stage, the drafts are closed about half way, the temperature raised to 135° F., and smoke is generated. The smoking continues throughout the third stage with all drafts closed, and the temperature is raised to 165° until the inside temperature of the ham reaches 142° F., when it is removed. These hams require further cooking in the home for full tenderization. Hams sold as "ready to eat" are those that have received extra heat processing to bring the internal temperature

FIG 9 2—Loosen the leaf fat over the inside of the ham butt and separate the artery A from the fat. Cut the artery long It differs from the vein V in that it is strong and elastic

of the ham to 155°-160° F. But unlike sausages, in which the meat is very finely ground, a ham processed to an internal temperature of 155°-160° F. will not eat like a sausage and therefore must have further preparation. An internal temperature of 180°-185° F. makes it ready to eat.

Curing Frozen Meat

Sharp frozen hams or hams frozen in freezer lockers at 0° F. and held in storage for one to eight weeks were immersion cured experimentally in three days less time per inch of thickness or ½ day less per pound than unfrozen hams.

It was found unnecessary to thaw hams before placing them in cure. Allowing frozen hams to thaw in pickle kept down the temperature of the pickle for a longer period, which was an advantage where there was no means of control in the curing cellar temperature.

A curing period of 6 days per inch of thickness when frozen hams were placed in an 85° pickle, and 5 days per inch if previously thawed and covered with an 85° pickle, gave the most desirable salt content. This was the equivalent of two days per pound of ham.

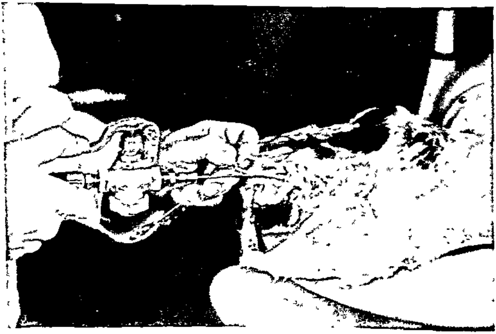


Fig. 9.3—Pump pickle into main artery ahead of the branch. If artery is too short, pump each branch separately.

Hams that were locker frozen and then cured were sound and very palatable after being held for three months in summer storage under farm conditions at 80° F.

Curing on the Basis of Days per Pound

In a study of the weight of hams versus their thickness, it was found that the following curing schedule is somewhat analogous:

60° pickle cure	4	days per pound of ham
75° pickle cure	3	days per pound of ham
85° pickle cure	2½	days per pound of ham
90° pickle cure	2	days per pound of ham

The dry sugar cure requires two days per pound minimum (using 1 ounce of dry formula per pound).

Bacon must be cured on the basis of thickness.

Aging Hams

Repeated experiments have shown that the salt concentration in the outside inch of hams is ten to twenty times as great as in the center at the time that they are removed from cure. The longer the curing period in a weak pickle, the greater the salt equalization. Hams cured under 60 days should be aged at least an additional 30 days to permit the salt to equalize.

Hunt, at the Maryland Station, found that hams aged in incubators at 108° F. for 10 to 12 weeks were comparable in quality and chemical composition to hams stored a year or longer at ordinary ham room temperature. He reported that hams aged in incubators shrank less for the same degree of aging than those aged in a ham room. The combined shrink of curing, smoking, and aging for nine weeks in a standard incubator was the same for both sweet pickle and dry cured hams, 23.2% in each case.

Canadian Bacon

The pork sirloin muscle stripped from heavy pork loins is used to make this product. It is given a mild cure and a light smoking. The two methods of cure are as follows:

Dry Cured Formula—

2¾ lbs. salt
1¼ lbs. sugar
3 oz. sodium nitrate
¼ oz. sodium nitrite

This is sufficient to cure 100 pounds of pork sirloin. Rub it on and place the rubbed sirloins in a tight box. Put sufficient pres-

sure on the meat so it will be covered with brine within several days. Cure for 10 to 14 days (depending upon size) in a temperature of 36° to 38° F. and then wash in hot water and drain for half a day. Place each sirloin in an artificial casing, tie one end of the casing, and force out the air pockets before tying the other end. Smoke for 12 to 15 hours at 125°-130° F., and after it has chilled to room temperature, dip it in water of 180° F. for a minute and wipe dry to remove the grease. Place the meat in room temperature to dry. The yield of boned and fatted loins will average 45% to 38% with ham butt removed.

PICKLE CURED

Make up a 65° salimeter strength salt solution and to each gallon of the pickle add ½ pound of sugar (preferably cerelose) and ½ oz. of cure (3 oz. of nitrate, ¼ oz. of nitrite). Overhaul on the third and seventh days and cure for two weeks at 36°-38° F. Soak in tap water for several hours and drain. Smoke for 10-12 hours at 125° F. If they are to be tenderized, smoke them at 125°-135° F. for eight hours and at 155°-165° F. for four hours.

Dried Beef

Both the dry cure and the sweet pickle cure method are employed. In either case, the formula is the same: 8 pounds of salt, 3 pounds of sugar, 3 oz. of sodium nitrate and ¼ oz. of sodium nitrite. When dissolved in 4 gallons of water this formula makes sufficient pickle to cover 100 pounds of meat. When used as a dry cure, apply 1 to 1½ ounces to each pound of meat. To do the latter will require two rubbings at three to five day intervals. Frequent overhauls are necessary where the self-formed brine collects in a tight vessel; otherwise, pieces resting in this brine will become too salty. Pickle curing requires less labor.

The length of time required to cure beef depends upon the size of the cuts, but three days per pound for the 85° sweet pickle cure and two days per pound for the dry cure are sufficient. The rounds of thin or inferior animals are used for this product. The muscles of the round are taken out in three pieces called the *beef ham* or *dried beef set*. They consist of the top round, the bottom round and eye muscle (together), and the knuckle piece (sirloin tip.) In case of large rounds, one or two extra pieces are made by splitting the top round. The shoulder clod muscle in the fore quarter is also used.

After the beef is cured, it is rinsed with cold water and allowed to hang for 24 hours to dry, and then given a light or

heavy smoke as desired. It is stored in a dry, well ventilated room for further drying.

Corning

The preservation of beef by the use of salt is termed "corning." Lexicographers explain the origin of the word by referring back to the sixteenth century when the word "corn" was synonymous with the word "grain." At that time manufacturers of gunpowder used the word "corning" to indicate that their product had been spread out and allowed to dry in single grains. The term corned was later applied to the process of curing beef by sprinkling it with grains of salt.

The method used in making "corned beef" today entails more than the mere application of salt. A formula that is rather popular consists of dissolving 8 pounds of salt, 3 pounds of sugar, 4 ounces of baking soda, 3 ounces of sodium nitrate, and ¼ ounces of sodium nitrite in 4 gallons of water. This is sufficient to cure 100 pounds of beef. Some sections of the country, such as the New England district, prefer a gray color to the cured beef, in which case the saltpeter is omitted. A very good color is secured by using 4 ounces of cream of tartar instead of the saltpeter. Boneless cuts of brisket, plate, chuck, and round usually are used for corning. Pack the cuts in a stone crock or wooden tub or barrel, cover them with the chilled pickle, and weight the meat with a board upon which a non-metal weight can be placed. If the brisket is not rolled and other cuts do not have more than 3 inches of thickness, they will cure (corn) and be ready to use in 12 to 14 days.

If more flavor is desired, a slight amount of garlic or pickling spices can be added.

The pH Factor

The symbol "pH" (the hydrogen-ion concentration) is an expression of the degree of acidity or alkalinity of a substance. The neutral point is 7 (using chemically pure H_2O as a basis) and a pH below 7 indicates the degree of acidity whereas a pH above 7 indicates the degree of alkalinity.

The pH of fresh meat ranges between 5.3 and 6.0. Meat of more alkaline character (6.0-6.5) will spoil bacteriologically at a faster rate than meat in the lower acid range (5.3-5.7). In pickle cures the pH range should be between 5 and 6. This means that some acid such as acetic, citric, or lactic may have to be

added if the sugar in the pickle will not furnish sufficient acid through bacterial fermentation. Whatever the means, an acid medium is necessary for the proper curing and manufacture of meat and meat products.

The claim is made that salt tenderizes meat at the 2% level. It is well known that acid will tenderize, so with an acid pickle, the two together should result in some tenderness.

Fresh meat will vary in pH depending upon the glycogen content of the muscle at the time of slaughter. It has been established that CO_2 immobilization of hogs reduces loss of muscle glycogen, resulting in a lower pH; that animals rested and fed before slaughter have a lower pH; and that the feeding of sucrose to cattle and hogs before slaughter will give them a lower pH resulting in improved color and keeping quality.

Conversely, a high pH and low muscle glycogen have been shown to be characteristic of dark cutting beef.

Souring

Most bacterial contamination comes from outside sources which can be controlled in part by rigid sanitation.

Various scientists (Bunyea, McBryde, Rerth, Boyer, Lewis, Moulton, and others) have worked on this problem and found that the organism that causes souring of beef around the deep-seated hip joint is *Bacillus megatherium* (Bunyea) while *Clostridium sporogenis, Cl, putrefaciens,* and *Cl. putrificum* cause souring in pork. These organisms are proteolytic (which means that they break down proteins into amino acids and ammonia) and flourish best at room temperatures or higher.

The results of considerable experimental work on beef and ham souring proved rather conclusively that quick chilling of the carcasses to 36° to 38° F., and similar holding and curing temperature, will practically eliminate the difficulty. From 3% to 5% salt concentration in the center of the ham, and small amounts of saltpeter and sodium nitrite, had inhibitory action on the ham souring organism. Moulton reports that the nitrite was ten times as effective in this respect as the nitrate.

Although curing ingredients inhibit the development of these anerobic organisms, they do not entirely destroy them. In very mildly cured products, proteolysis may continue to the point where the product is unfit for food. The remedy in this case is to hold the product under refrigeration.

Flavor

Probably the greatest objection of consumers to quick cured, tenderized ham has been its apparent lack of flavor in comparison with long cured ham. The curing process entails more than simply the introduction of sufficient salt to preserve the meat. In the prolonged curing process there is an enzymitic action and a bacterial action by the clostridia which produces a distinctive flavor that is not as pronounced in "quickies" (quick cured hams). This action in combination with just the right amount of salt, enough sugar, and a good pink color make for quality in a ham.

The Smoking Process

Cured meats are soaked or washed before being placed in the smokehouse. Allow them to drain and dry before starting a fire. Care should be taken to avoid one piece of meat touching another. Wire hangers are preferred to string for supporting the different cuts. These can be made out of No. 9 gauge galvanized wire or they may be purchased from a butchers' supply house. Net ham bags are used by packers.

Where wood is subjected to destructive distillation it yields inflammable gases, a strongly acid agueous distillate and a quantity of tar. The residue is wood charcoal. The agueous distillate contains methyl (wood) alcohol mixed with acetic acid and acetone and a little methyl acetate and is known as pyroligneous acid (liquid smoke).

Section III, Article 5, of the Pennsylvania Pure Food Act of 1909, which is still in effect, states that "Smoke must be applied as generated" to meat that is to be sold on the market. This eliminates the use of liquid smoke or smoked salt by Pennsylvania processors except for meat that is to be consumed in the home by the processor.

The wood used to generate the smoke should be of a species in no way related to the pine or resinous tree. Hickory is the most popular but apple, plum, peach, oak, maple, beech, ash, or any non-resinous wood will give satisfactory results. Dry corn cobs are excellent for starting logs to smoldering; in fact, meats can be smoked successfully by the use of corn cobs alone. Where a cool smoke is desired, hardwood sawdust is the most satisfactory. Hardwood sawdust is used in the smoke generators that are a part of the equipment in producing tenderized hams. Smoke generated by friction (revolving the surface of a log against a spinning steel plate) is used to some extent.

Temperature in the Smokehouse

The absorption of smoke and the change in color of the outside surface of smoked meat is hastened by high temperatures. The nature of the smokehouse and the outside temperatures are governing factors in the length of time required to smoke meat. It requires about 30 to 40 hours to smoke meat to a chestnut brown in one continuous smoking period with a smokehouse temperature of 90° to 100° F. The same results are secured in 18 hours with a smokehouse temperature of 125° to 135° F. but it will require 3 to 4 days to get the same color with a cool smoke of 80° to 90° F. There is no particular advantage in a prolonged smoking period.

The colder the weather, the drier the wood should be to get the required heat. In warm weather a semi-green wood is preferable. Meats that have been subjected to four to six days of smoke or until they become dark brown in color have some added keeping qualities, but unless the outside surface is trimmed off before cooking, the meat is likely to cause digestive disorders. This is due to the poisonous effect of too large quantities of the pyroligenous acid.

Shrinkage

Shrinkage in weight is not as great during the smoking process as it is in the subsequent holding of the smoked meat. Sweet pickled meats will lose only the 2% to 5% that they gained in cure. If they are sold as soon as they are smoked there is practically no shrink from the green weight. The real shrinkage takes place during the first month of storage and this averages about 7% for hams and 10% for bacon.

Dry cured meats shrink from 5% to 7% during the curing period and thus do not lose as much weight in smoke or in the subsequent holding period. Dry cured meat shrinks about 2% in smoke as compared to 4% for the sweet pickled meats. Smoked hams held for 3 months will shrink about 20% from green weights.

THE SMOKEHOUSE

The most satisfactory type of smokehouse, that will serve also as a storage place for the cured and smoked meat, is one that is constructed of tile or cement blocks with a fireproof, insulated ceiling. The floor should be made of concrete, and the entire

building must be rodent and vermin proof and have well-screened ventilators. One intake ventilator near the floor and an outlet near the roof are necessary. The dead air spaces provided by a tile or concrete block building make for a more even temperature for storing meat in winter and summer.

The size of the building is dependent upon the amount of smoked products to be run through it. On the average farm a house 6 by 8 feet with walls 9 feet high is entirely adequate. The metal rods to support the meat should be about 8 feet from the floor. If the fire is built in the smokehouse itself, it will be necessary to hang the meat so that it will not be directly over the fire. Another method is to weld a piece of heavy sheet metal about three feet square to four metal legs about three feet long and place it over the fire so it will diffuse the heat.

Where a cool smoke is desired it will be necessary to construct a fire pit outside the smokehouse and conduct the smoke into the house through terra cotta pipes.

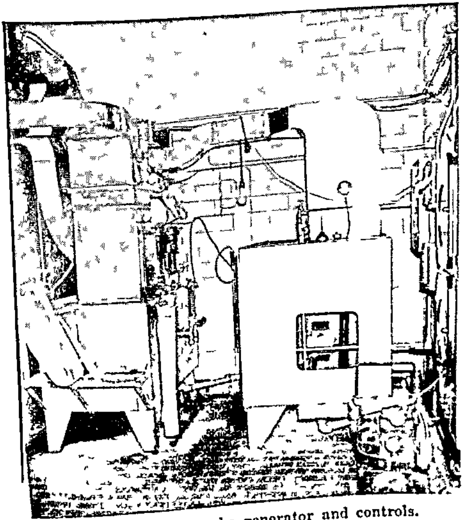


Fig. 9.4—The smoke generator and controls.

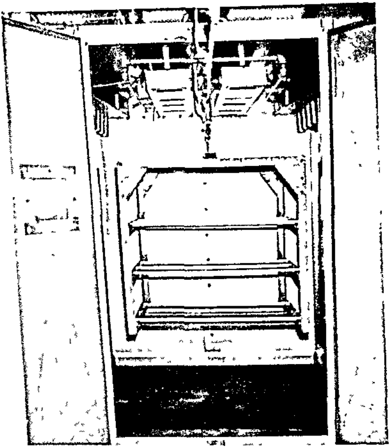


Fig. 9.5—The vented smokehouse with water showering equipment.

The modern smokehouse units now in use are a far cry from the chimney type that once was so common. Today's smoke units are constructed of shiny, noncorrosive metal, well insulated and electronically controlled. They are designed so the volume of smoke and the temperature can be set automatically. The smoke vents are distributed around the ceiling and the smoke circulated downward to eliminate dead spots. Some units also do the cooking by showering the products with hot water and then chilling them with cold water. It requires skill to operate these units, and even more to repair them, but the improvements in the quality of the product, the speed of production, and the control of the processing are indisputable.

Cleaning the Smokehouse

The deposit of the wood distillate on the walls and hangers of smokehouses that are in regular use develops a scale that falls on the meat, making it necessary to remove the scale periodically.

Since the tarry material is combustible, a torch must never be used. A detergent should be sprayed on the walls to soak the tar; follow this with a forceful spray (25 to 50 pounds per square inch) of hot water. A special detergent for this purpose is made by Oakite Products, Inc., of 20 A Thames Street, New York 6, New York.

SMOKED TURKEY

Something new, something different is probably the main recommendation for most of the smoked turkey found on the market. The process of curing turkey, which also has been successfully applied to chickens, is very similar to that used for curing pork. The make-up of the curing formula differs from the pork curing formula mainly in the spices used.

The following formula gave excellent results at the Pennsylvania Station: 6 pounds of salt, 2 pounds of cane sugar, 2 ounces of saltpeter, 1 ounce of bay leaves, 1 ounce parsley leaves and 1 ounce black pepper. Dissolve in 4½ gallons of hot water and let cool. This constitutes a 65° salimeter pickle. The birds are placed in a clean barrel, vat, tub, or crock with rump up and backs to the vessel. This puts the breasts on the inside. The next row would be placed breast to breast. Place a weighted board over the birds and cover with pickle. Cure them 1½ days per pound of bird. A quicker cure is to make a 75° pickle and cure 1 day per pound. Both tests gave about the same results in flavor and salinity.

When cured, the birds are rinsed in cool water and suspended by the wings to dry. This will require several hours. The smoking will require from 4 to 36 hours, depending upon the temperature of the smokehouse and the color desired. Birds smoked for 8 hours at 110° F. will have a bright amber shade as will those smoked for 24 hours at 80°-90° F. Four to six hours at 135°-140° F. is faster and produces a good color. Birds to be shipped long distances should receive a heavier smoke and be dark chestnut in color. Tenderized turkeys can be produced by subjecting the carcass to a smokehouse temperature of 170° F. for 8 to 12 hours (depending upon size) and applying the smoke during the latter part of the period.

The flavor of smoked turkey has very little resemblance to fresh roasted bird and has little to recommend it unless the smoked flavor is further supplemented with spices. By the proper blending of certain spices some brands of smoked turkey have

become popular. Needless to say, these formulas are trade secrets. Some formulas do not contain saltpeter since it causes a slight reddening of the meat. To illustrate the elaborate degree of seasoning and spicing that can be employed, the following formula as suggested by Highlands and Burns in *Food Industries* is given:

Water 5 gals.	Salt 4 lbs.		Sugar 30 oz.
Oil of celery	8 c.c.	Oil of marjoram	5 c.c.
Oil of black pepper	8 c.c.	Oil of bay leaves	6 c.c.
Oil of parsley leaves	8 c.c.	Oil of sweet basil	6 c.c.
Oil of sage	5 c.c.	Oil of coriander	5 c.c.
Oil of thyme	5 c.c.	Oil of cardamon	5 c.c.

Oils dissolved in 200 c.c. of alcohol and 1 gr. of gum tragacanth.

The dissolved oils are added to the brine and the birds cured for 1.5 days per pound of dressed weight.

Cured and smoked turkey do not have the keeping qualities of cured pork and should be used as soon as possible. They are unsuited to storage because they have insufficient salt content to keep down bacterial action; they mold easily, and dry out rapidly.

STORAGE OF SMOKED MEATS

Various methods of holding and storing cured and smoked meats have been tried with different degrees of success. Some of these methods include (1) covering with paraffin, (2) burying in oats, (3) covering with oat flour, (4) dusting with borax, (5) packing in salt, (6) painting with yellow wash, (7) shrouding in rubber, (8) suspending uncovered in a dark room, (9) suspending uncovered in a dark, well-ventilated, well-screened room, (10) spraying with oat oil, (11) spraying with soy bean oil, (12) packing in refined cottonseed oil, and (13) wrapping in paper.

Hams sometimes have been placed in paper sacks, with cords drawn tightly about the open ends, and deeply covered with oats. The advantages of this type of storage lie in the fact that a very even temperature prevails, the air is dry (the outside covering of oats will absorb the moisture), and rats and mice cannot burrow through oats. The disadvantage of this method is that the smoked meats will take on a stale, musty flavor and become moldy.

A method of storage recommended by the Texas Station is to place the cured product, smoked or unsmoked, in refined cottonseed oil.

D. E. Brady and F. H. Smith of North Carolina State College report that rancidity in cured meat is effectively retarded by a thin coating of crude cottonseed oil. Refined cottonseed oil is not as effective. Storing in a dark room or wrapping in dark paper also retarded rancidity.

Dusting cured and smoked hams and bacon with powdered borax will keep off skippers, but its use is not permitted on commercial meats under present food laws.

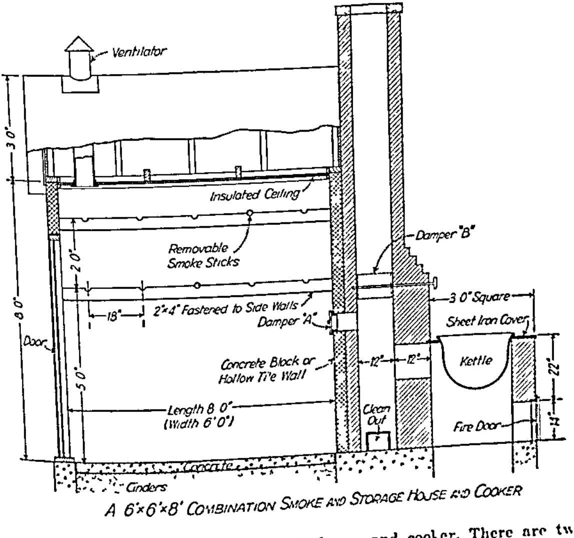
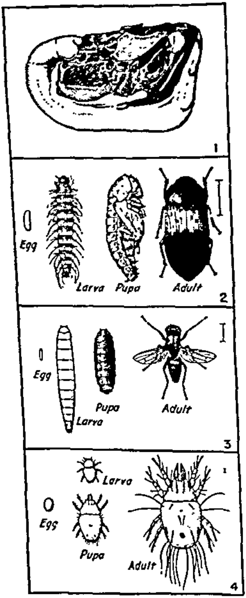


Fig. 9.6—Plan for a combination smokehouse and cooker. There are two tiers of removable smoke poles made from 2-inch pipe, drilled and pegged every 18 inches, the metal pegs extending through either side of the pipe for hangers. The oven with a 28-inch (50-gallon) cast-iron, open fire kettle built in, is used for rendering and cooking as well as being the fire-box for generating smoke. This fire-box is made of brick and can be erected at the end of any building that is to be used as a smokehouse. When the kettle is to be used for cooking purposes, close damper A and open damper B. When smoking meat, keep water in the kettle, close damper B after the fire is started and open damper A. Two inches of concrete laid over 6 to 9 inches of rock and cinders will make a satisfactory floor.



Pests of Stored Meat[1]

(1) Cross section of ham showing damage by insects and mites.

(2) The larder beetle is typical of several species of small beetles and their wooly larvae that feed on meat and cheese. The beetles are strong fliers.

(3) The ham or cheese skipper gets its name from the jumping habit of the larvae. The flies are smaller than houseflies. They lay their eggs on meat and cheese and multiply very rapidly.

(4) Cheese mites are not insects, but cause damage to meat and cheese similar to that caused by insects. Though they cannot fly, they are carried by various insects.

[1]Taken from pamphlet A15-52. United States Department of Agriculture, Washington, D. C.

Fig. 9.7

Packing the cured and smoked pork shoulder, ham, or bacon in rock salt has proven fairly satisfactory, but the product is rather dry and somewhat salty.

A paint is made by dissolving 6 ounces of flour in 1 gallon of water to which is added 1¼ ounces of chrome yellow and 1 ounce of dry glue dissolved in 1 quart of hot water. Bring this

mixture to a boil and add 3 pounds of barium sulfate, stirring constantly while boiling until it is in the form of a paste. If it becomes too thick, add more water. Allow the mass to cool before using. Wrap the ham or bacon in a good grade of wrapping paper, sew a muslin cover over the wrapped meat, and apply a coat of this paint to the outside of the muslin. The advantages of this method are that it will keep out insects and help to hold down shrinkage. The disadvantages lie in the extra labor entailed in the operation and in the fact that it will not prevent mold.

Spraying the cured and smoked pork with oat or soybean oil assists in overcoming rancidity.

Slaughter, cure, and wrap meat before insects start to work in the spring. Use waxed or greaseproof paper. Place the meat in a muslin sack, tie it tightly at the top, and hang it so two pieces do not touch. Store the meat in a clean, tight, well ventilated room or smokehouse and use mesh screen over vents.

If meat becomes infested in spite of these precautions, remove it from the storage room and trim out the infested parts, cutting deeply enough to remove all larvae. The uninfested part of the meat is safe to eat. Use it rather promptly or store it in the refrigerator.

Where it is desirable to fumigate infested meat without removing it from its hangings, hydrocyanic acid gas may be used. Close all doors and windows and have a trained person fumigate for 24 hours with the gas at the rate of 4 ounces of sodium cyanide or the equivalent in other cyanide form, to 1000 cubic feet of space. Repeat the treatment every 10 days until no insects are seen.

Retarding Molds on Stored Meat

Mold spores are prevalent in the air and require only the proper moisture conditions for their development. They flourish in a rather wide range of temperatures and under varying degrees of light intensity. The most effective way of preventing molds on untreated smoked meats is to store them in a dry, well ventilated room ranging in temperature between 45°-55° F. Suspend the unwrapped meat in such a manner that it does not touch other meat. The disadvantage of this method of holding meat is the larger loss in weight due to dehydration, but loss in weight is preferable to moldy flavored meat.

The safest method of storage is to wrap the whole ham or slab of smoked bacon in a good grade of locker paper and store

it in the zero freezer cabinet. Do not freeze sliced ham or bacon for a period longer than two months.

Measly Pork

The hog is an intermediate host for the common tapeworm of the human, acquiring the eggs of the worm from contaminated food or water. The eggs hatch in the hog's stomach and intestines and the embryos bore through the walls into the muscle tissue where they turn to worms and become encysted. These cysts are visible to the naked eye. Badly infected carcasses are usually condemned. Thorough cooking and zero freezing destroy the encysted larva.

Trichina

The microscopic parasite "Trichinella spiralis" or Trichina is not a common parasite in this country and is easily controlled. The encapsulated larvae are found in the muscle of rats, dogs, cats, swine, and humans. Man acquires the parasite by eating the improperly prepared meat of infected swine. The swine receive their infection by eating infected rats or uncooked or partially cooked viscera or flesh of infected animals, generally through the medium of garbage.

The encysted larvae are liberated in the stomach of the host and pass on to the small intestine where they reach sexual maturity in a few days. After mating, the female penetrates the lining of the intestine and gives birth to young larvae which are carried by the blood stream to the striated muscles where they attain maturity after several weeks. Encapsulation then takes place and if the cycle is not repeated, the larvae in the cysts eventually die.

Precautions Against Trichina

The consumer need have little fear of developing trichinosis if as a personal responsibility he (1) insists on having all of his pork cuts served "well done"; (2) refuses to eat rare hamburg sandwiches (a great deal of hamburg has some pork ground with it); (3) refrains from eating so-called tenderized hams until they have been cooked (a temperature of 137° F. destroys Trichina); and (4) purchases only those ready-to-eat products which bear the United States stamp or are prepared according to federal or state regulations.

The producer and processor should (1) maintain satisfactory sanitary conditions on the premises; (2) eliminate rats; and (3) cook all garbage containing meat or offal to destroy the parasite.

Freezing meat at zero for 24 hours is reported to kill Trichina.

The Federal Meat Inspection regulations, as amended on March 24, 1945, require that all pork being used in uncooked or uncured pork products which are likely to be eaten without being cooked by the consumer must be subjected continuously to a temperature not higher than one of those specified in the following table:

Temperature °F	Group 1 Days	Group 2 Days
5	20	30
−10	10	20
−20	6	12

Group 1—Pork in separate pieces not to exceed 6 inches in thickness; layers of pork not to exceed 6 inches in depth; or frozen blocks not to exceed 6 inches in thickness.

Group 2—Pork in pieces, layers, or within containers the thickness of which exceeds 6 inches but not 27 inches.

The arrangement of the pork in the freezer must permit of free circulation of air to insure prompt reduction of temperature of the meat throughout to those specified in the table.

M. I. D. Memorandum 155, effective Oct. 1, 1950, stated:

Application of curing solution to meat cuts such as ham, pork shoulders, picnics, butts, beef briskets, beef tongues, barrel beef, mess pork, and the like, by injection or otherwise shall not result in an increase in weight of the finished cured product of more than 10% over the fresh green weight. The weight of the cured and smoked product shall not exceed the weight of the fresh uncured article.

At least 1½ pounds of sugar or 2 pounds of honey shall be used in curing each 100 pounds of product which is subsequently marked or labeled "Sugar Cured" or "Honey Cured" respectively.

U. S. D. A. order of December 30, 1960, authorized Federally inspected plants to produce smoked hams (sale weight) with up to 10% moisture over green weight (110%) to supersede the order of October 1, 1950, which sanctions the 100% ham.

X.

COLD STORAGE AND REFRIGERATED FOOD LOCKERS

PRESERVING BY REFRIGERATION

Natural or artificial refrigeration retards the development of molds and bacteria for a limited period only. The most effective refrigerator temperature outside of subfreezing temperatures is the one bordering on 32° F. A temperature of 40° F. is more practical for the household refrigerator because there will be less dehydration and a lower operating cost. Commercial meat coolers are usually held at 36° to 38° F.

How Cold Is Produced

The formation of heat for the production of cold is the thermodynamic principle involved in artificial refrigeration. A gas that will turn to a liquid when compressed by mechanical means, and that will again revert to a gas when the pressure is released, will accomplish this, and when it is so used is known as a refrigerant. One of the most common refrigerants used to chill the coolers of meat packers and cold storage houses is ammonia (NH_3). It is seldom used in household refrigerators because of the noticeable odor in case of a leak. When ammonia gas or any gas is compressed, heat is generated. If the heat is removed by passing the compressed gas through water jacketed coils (condensers) or a fan-cooled condenser, the gas turns to a liquid. Permit this liquid to escape slowly through an aperture in a valve (expansion valve) into expansion coils located in a refrigerator and the first element that is required by the refrigerant is the heat which had been taken from it by the condensers.

The only available heat supply is in the air that lies in direct contact with the expansion coils and the refrigerant absorbs this heat as it passes through the coils on the return trip to the compressor to which it is drawn by the suction of the pistons. The cycle continues as long as the compressor is in operation. In the

household type refrigerator, the heat taken out of the refrigerator helps to keep the kitchen warm. In the case of water-cooled condensers, it disappears down the drain. To save on the water bill, large establishments chill the water after it leaves the condenser and reuse it until it becomes too rusty. Some of the common refrigerants are carbon dioxide (CO_2), sulfur dioxide (SO_2), ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), isobutane $(CH_3)_3CH$, methyl chloride (CH_3Cl), ethyl chloride (C_2H_5Cl), and the freons. Virtually all of these refrigerants are noncorrosive in the absence of moisture. SO_2, CO_2, and Freon are nonexplosive. Freon-12 is the most widely used refrigerant.

History

The purpose of the cold storage locker is to freeze and store properly prepared meats, fruits, and vegetables for future consumption. The particular kind of service rendered by a locker plant is reported to have started on the Pacific Coast about 1903. The Chico Ice and Cold Storage Company of Chico, California, is credited with being one of the first plants to rent cold storage space to local merchants for storing eggs, apples, and other produce. They extended this service to farmers for the storage of meat in boxes in 1908. The demand for this type of storage increased to such an extent that in 1917 it became necessary to construct another room in which wooden lockers of different sizes were built to operate as drawers in a frame.

A similar cold storage business was started at Centralia, Washington, in 1917. About 1920, soon after the beginning of the dry era, a former brewery at Sioux City, Iowa, was converted into a dairy plant which provided freezer locker service for former patrons. In 1927, at Walla Walla, Washington, the local dairyman's association provided room for the members of the association to use to freeze and store rabbits and other game. A number of creameries, ice plants, and milk plants installed freezer lockers throughout the Middle West in the ensuing eight years, but it was the period following 1935 that witnessed a phenomenal increase in this type of service. The increase in locker plants during 1940 to 1945 was insufficient to meet the demands of clamoring patrons who were growing their wartime food supplies. The limiting factor was wartime priorities.

The Effect of Freezing on Meats

Freezing is the modern means employed to preserve food products in a condition that most closely resembles the fresh

X.

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July 1955 and 1960 Count of Locker Plants by States.
(Decrease of 1,692 plants.)

State	1955	1950	State	1955	1960	State	1955	1960
Alabama	66	59	Maine	19	19	Ohio	391	332
Arizona	47	37	Maryland	42	39	Oklahoma	228	247
Arkansas	93	82	Massachusetts	27	27	Oregon	497	433
California	461	406	Michigan	317	271	Pennsylvania	276	273
Colorado	208	167	Minnesota	647	598	Rhode Island	5	5
Connecticut	55	37	Mississippi	66	56	South Carolina	51	48
Delaware	9	11	Missouri	438	405	South Dakota	294	242
Florida	69	39	Montana	207	194	Tennessee	106	89
Georgia	103	80	Nebraska	509	414	Texas	473	417
Idaho	165	147	Nevada	17	16	Utah	130	114
Illinois	518	452	New Hampshire	20	13	Vermont	45	31
Indiana	324	279	New Jersey	55	43	Virginia	69	57
Iowa	824	678	New Mexico	50	40	Washington	683	590
Kansas	523	514	New York	246	193	West Virginia	19	18
Kentucky	90	87	North Carolina	98	98	Wisconsin	630	539
Louisiana	39	39	North Dakota	225	194	Wyoming	89	64
						Total	10,553	8,861

Total	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938
Plants	11,596	11,608	11,596	11,245	10,617	9,523	8,025	6,484	5,252	4,559	4,323	3,623	2,870	1,861	1,269

A decrease of 2,735 plants since 1952.

product. This is accomplished by the almost complete inactivation of enzymes and bacteria through the use of low temperatures. The lower the temperature, the greater the inhibitory action and the longer the period of satisfactory storage. To secure and maintain very low temperatures requires expensive construction and entails high operating costs. The industry has been utilizing temperatures ranging from 0° to —60° F.

Lean meat averages from 60% to 65% water, a liquid which expands at both high and low temperatures. The actual point at which meat juices will freeze solid is not 32° F. but 28° to 29° F. The rate of crystallization and the size of the crystals formed are dependent upon the temperature. Slow freezing causes the water to separate from the tissue into pools that form large crystals. These stretch and rupture some of the surrounding tissue. Rapid freezing results in very little water separation and the crystals are therefore small and less expansive. Because there is practically no pool crystallization in very low temperature freezing, the drip is considerably less than on meats frozen at higher temperatures.

Low temperatures do not destroy vitamins. Most of the vitamin loss is caused by heat or light or is lost in the juices that escape.

Experimental work to date has indicated that for best results: (1) an animal must be physically sound (in good health); (2) it must be properly bled (fiery carcasses do not keep well);

case of pork, the nature of the fat makes it more vulnerable to oxidation and therefore lowers its storage life below that of beef, veal, and lamb. It is very important, therefore, to trim closely or to freeze only those cuts that are quite lean. For example, tests on sausage of different degrees of fatness showed that the lean sausages had longer storage life than those containing more fat. It has also been demonstrated that pork that was frozen after 48 hours of chill had longer storage life than pork that was chilled for 7 to 14 days before it was frozen. The same was true of the sausage made from such pork.

Cutting Method for Frozen Storage Meats

Tests conducted at Kansas and Michigan experiment stations show that boning meat has no effect on the flavor or juiciness of the cooked meat and that packaging boneless meat is easier, causes less damage to wrappers, and saves up to 35% of frozen storage space. The expense of boning adds from ½ to 1 cent per pound labor charge over the usual manual method with bone-in, or from 1 to 2 cents per pound on a time basis over the power saw method. This is absorbed in part by less necessary rental space, smaller amount of paper required, and the ease and satisfaction in cooking and carving.

Probably one of the best methods for breaking down a carcass of beef for subsequent boning is the National style explained in this text. Regardless of the method used, the cuts should be made ready for the oven and in such sizes as will best meet the needs of the family. Some cuts other than the standard ones, such as the top round muscle sliced into chipped steak (about No. 7 on the slicing machine) make for variety and aid in menu making. Giving the top round a slight freeze (not solid) will make it slice evenly.

WRAPPING MATERIALS

Wrapping materials suitable for meats come under five general groups: (1) wax or paraffin treated kraft papers, (2) cellophane, (3) aluminum foil, (4) laminates, and (5) the films (polyethylene and pure or mixed polymers or co-polymers of vinyl chloride, vinyl acetate, or vinylidine chloride).

The characteristics of these wrapping materials differ and their suitability for packaging meats, vegetables, and fruits depends upon how closely they come to meeting the following requirements: (1) low moisture vapor transmission, (2) good

Aging

Experiments show that the length of the holding (aging or ripening) period has a direct bearing on storage life because it permits oxygen absorption by the exposed fat. This raises the question whether meat that is to be frozen should be aged. It was found that the aged meat showed higher peroxide values and shorter storage life than the 48 hour chilled meat. It also showed that although the ripened meat was slightly more tender during the first month of storage, this advantage disappeared in the subsequent months, the fresh and aged meats being on a par for tenderness. These things being true, aging meat for the development of flavor, aside from its tenderizing effect, becomes a questionable practice for meat that is to be held in zero storage for more than 6 months.

It may be of interest, at this point, to give the results of a test run at the Pennsylvania station on the effect of different freezing temperatures on the tenderness of meat: "We had read where a scientist predicted that in the not so distant future there need not be such a thing as tough meat. When subjected to temperatures approaching the absolute, all meat would be made tender. We felt encouraged and slaughtered an eleven year old Angus cow. The carcass was chilled for 48 hours and steaks were cut from the top round. Three of these steaks were frozen at —110° F., the lowest temperature we had available and some 300 degrees from the absolute (—461° F.). The other three were frozen at 0° F. All six steaks were stored at zero. At the end of one month, the test showed the steak frozen at —110° F. to be the more tender but it was far from being so tender that it could be cut with a fork. At the end of six months of zero storage, the —110° F. and zero frozen steaks were of the same tenderness but the low temperature steak was not as juicy. The same was true at the end of ten months when both steaks were beginning to show a slight degree of rancidity."

Trimming Fat

What about the fat on meat? Again the results indicate that it is advisable to trim closely before freezing. The fat probably won't be eaten even if it is palatable; it will taint the lean if it oxidizes; and it takes up that much more storage space. The fat on carcasses of corn-fed steers did not oxidize or become rancid as rapidly as the fat on grass-fed steers. This is ascribed to the amount of unsaturated fats present in grass-fed steers. In the

fresh meat displays that must have bright color and maintain it for 24 to 48 hours. It is the oxygen that is allowed passage to the meat that is necessary to combine with the pigment myoglobin to form oxymyoglobin, which gives the desirable bright red color.

To maintain this bright red color and increase oxygen solubility, it is necessary to maintain a low temperature. The time that meat will maintain this bright color is also dependent upon sanitary conditions and the method of handling. The darkening of the meat, which is the further oxidation of the oxymyoglobin to metmyoglobin (brown pigment), is hastened by bacteria and increasing temperature.

Since the maintenance of cured meat color depends upon the absence of oxygen, a paper impervious to oxygen must be used. Cured meat color changes to gray and shades of brown when displayed under lights, dependent upon light intensity.

Aluminum foil has become a standard kitchen accessory in the American home because it serves so many uses. It is tasteless, odorless, non-toxic, waterproof, greaseproof, non-absorptive, non-shrinking, non-swelling, non-softening, has an extremely low gas transmission rate, is pliable and shapeable, making close contact with the product it encloses, heats and cools quickly, and is non-inflammable—making it a cooking utensil in itself. Its weakness is its lack of strength. Laminated foil makes an excellent wrap for frozen meats.

Laminates are made by combining two or more layers of different materials into a single sheet to eliminate weaknesses that occur in one and not in the other. They are strong and will withstand rough handling.

The plastic films, made in most part from synthetic resins or synthetic or natural polymers, have certain advantages over the packing materials just discussed. These advantages are flexibility, toughness, durability, and sealability. Probably the most suitable of the plastic films for frozen food packaging is Polyethylene. It is moistureproof, has a low vapor transmission rate but a high transmission rate to other gases, is tough and flexible at low temperatures, and can be heat sealed. A shrink-on, breathing polyethylene film called Type L CryOvac (a low cost film) is adapted to contour packaging of fresh meats and poultry.

Vinyl Chloride films have low vapor and gas permeabilities which make them well suited for vacuum and gas packaging. They are either opaque or transparent, strong, tough, heat seal-

tensile strength, (3) pliable, (4) maintain pliability and tensile strength at sub zero temperatures, (5) non-toxic, (6) odorless, (7) ease of marking for identification, (8) stripping qualities (will peel from meat when frozen), and (9) grease- and stain-proof. The moisture loss or shrinkage of any food during freezer storage must be held to a minimum. An excess of 8% shrink in meats and 3% in fowl is considered by many to make them unacceptable as fresh meat. This loss in weight is easily measured and the change in color, aroma, flavor, and texture are in about the same proportion as the loss in weight. To hold dehydration to a minimum necessitates the use of a paper that has a low moisture-vapor-transmission at low temperatures.

The manufacturers of packaging materials have made rapid strides in producing superior grades in the five groups mentioned. The materials in Group 1 are basically wood pulp papers. Kraft (German meaning strong) is the most widely used wrapping material. The grease-proof variety is the dominant paper used in retail meat shops. The waxed and the laminated kraft papers are popular for wrapping foods to be frozen. They come in many forms having different qualities that give protection against oil, grease, chemicals, molds, moisture vapor transmission, and water.

Another wood pulp paper that is used extensively is vegetable parchment, which has many uses depending upon its treatment. Some grades are impervious to oxygen, carbon dioxide, and nitrogen. The coated parchment is used for freezer-wrapped meats. The newest type is the silicone-treated vegetable parchment which has anti-sticking properties that make it useful as dividers for frozen meat cuts and hamburg, sausage, and lamb patties in particular.

Still another non-porous, very dense pulp paper is known by the name "Greaseproof." The more highly refined greaseproof paper is Glassine. The laminated, coated, and waxed varieties are not only greaseproof but also moistureproof and vaporproof, keeping odors from penetrating from the outside.

Cellophane, the original transparent film, comes in many forms. The one most prominent for packaging fresh meats is coated on one side with a nitrocellulose coating which is moistureproof but allows oxygen to enter. The meat is placed on the uncoated or wettable side. The increase of the water content absorbed from the meat increases the film's rate of oxygen permeability. This is the recommended cellophane for wrapping

TEMPERATURE, LENGTH OF STORAGE, AND THAWING

The lower the temperature, the longer the period of successful storage. Recommendations are definitely for zero or lower, the limiting factor being the cost of the equipment and the cost of maintaining the lower temperatures.

The length of the storage period should not be over twelve months, for economic reasons if for no other. With a proper wrap in good quality paper and a zero temperature, practically all "lean" meat will keep well for six to eight months with some exceptions. These exceptions have to do with products that contain salt, such as seasoned sausage, liver pudding, scrapple, and sliced ham and bacon slices.

W. L. Sulzbacher, bacteriologist for the U.S.D.A., reports: "There is no indication that frozen meat becomes more perishable after thawing than fresh meat."

Repeated tests made at the Pennsylvania station showed:

1. That meat which was thawed in the unopened package exceeded the keeping quality of unwrapped fresh meat.

2. That meat which was alternately thawed and refrozen as many as three times before being unwrapped was the equal of the meat used after one thawing.

3. That meat which was unwrapped and thawed and then rewrapped and refrozen was not materially changed in palatability other than that it was slightly drier because of the juices it had lost.

There is no reason to hesitate to refreeze meat when occasion demands, but it should be done within the day. If it is to be used the following day, place it in the rear of the refrigerator rather than refreezing it for that short period. Thawing may be accomplished in various ways to suit the conditions, or the meat may be cooked in the frozen state, in which case it will require a slightly longer cooking period.

Freezer Storage of Seasoned Meats

Salt affects the rate of fat oxidation, causing cured meats or meat products seasoned with salt to acquire a flat, rancid taste in a shorter time than the unseasoned product. As stated previously, whole hams, picnics, or butts properly wrapped in a good grade of locker paper will maintain the original flavor for six months or more. However, half hams or sliced bacon will lose flavor within the month.

able, and can stand temperatures as high as 300° F. for short periods. This makes them suitable as casings for products that are to be heat processed. Saran and CryOvac are examples of this type of film, the latter being particularly adapted for articles of irregular shape about which it can be heat shrunk by dipping the vacuumized package in hot water to form a skin-tight covering.

Another type of film, having a rubber base, is known by the trade name of Pliofilm (rubber-hydrochloride). Many types are made for special uses but it has not been employed to any appreciable extent as a wrap for frozen meats.

The films have gained wide consumer acceptance as a preservative cover for fresh vegetables, particularly in the bag form. They lack the qualities sought as a cover for frozen foods in that they are difficult to handle and hard to mark for identification.

Manner of Wrapping

The most desirable method from the standpoint of maximum air seal is the apothecary or drug store wrap, although work at Kansas gave as good results with the use of the butchers' wrap. The quicker and more rugged method is the butchers' wrap, which gives the package a double thickness of paper. With a little practice most people, and particularly the gentle sex, become quite proficient and speedy with the drug store wrap. It does not pay to economize on paper, either in quality or quantity.

It is highly important that cuts of meat be compact and as nearly square or rectangular in shape as possible. There should not be sharp edges of bone protruding to puncture the paper. Press the paper tightly to the meat to exclude all the air possible and make the entire job practically air tight. Place waxed paper between cuts if several are wrapped in the same package. An adhesive tape made especially for low temperatures is used in securing the package. It has the added advantage that the mark of identification can be placed on it. Heat sealing gives another advantage in that it excludes the air and does the binding at the same time. Ground meat should be compacted to exclude as much of the captured air as possible before wrapping. Waxed cartons or containers with inner bags or lining make suitable receptacles for diced and ground meats.

Power Cutting a Side of Beef

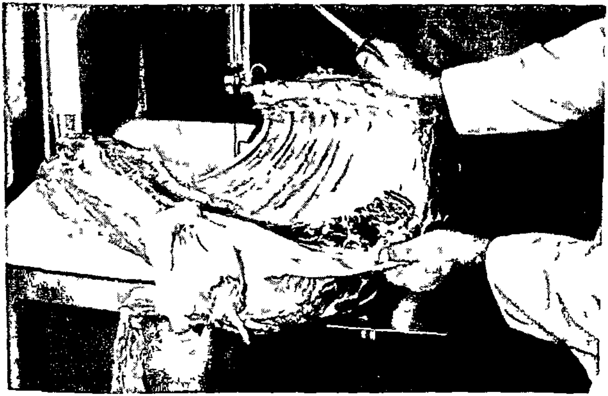

Fig 10 3—Removing the membrane from the skirt and short plate

Fig 10 4—Cutting the skirt from the short plate

Power Cutting a Side of Beef

Fore Quarter

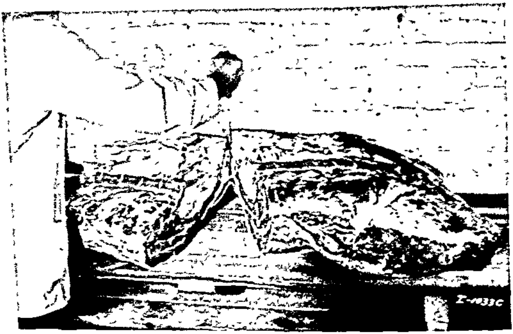

Fig. 10.1—Dividing the cross cut chuck and rib with short plate attached by cutting between the 5th and 6th ribs.

Fig. 10.2—Removing the brisket and fore shank by cutting across rib at the junction of the 1st rib with the breast bone.

Power Cutting a Side of Beef

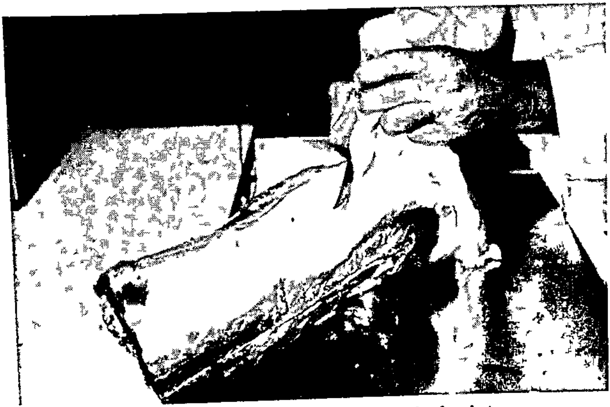

Fig 10 7—Trimming the fat from the brisket

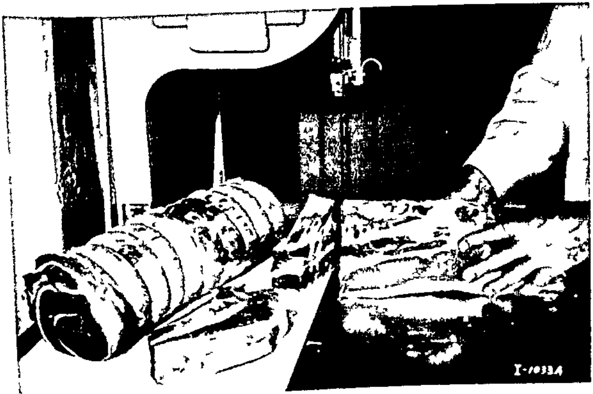

Fig 10 8—The brisket can be boned and rolled, boned and corned as a flat piece, or cut into boiling pieces

Power Cutting a Side of Beef

Fig. 10.5—Separating the rib from the short plate.

Fig. 10.6—Cutting short ribs from the short plate. By cutting a strip 6 inches wide instead of *the usual 3 inch short rib,* it is possible to make an attractive "crown flat rib roast." Use 6 and preferably 7 ribs for this cut. It is a pot roast that can be filled with mashed potatoes when served.

Power Cutting a Side of Beef

Fig. 10.11—Separating the 6th and 7th ribs from the blade end of the rib.

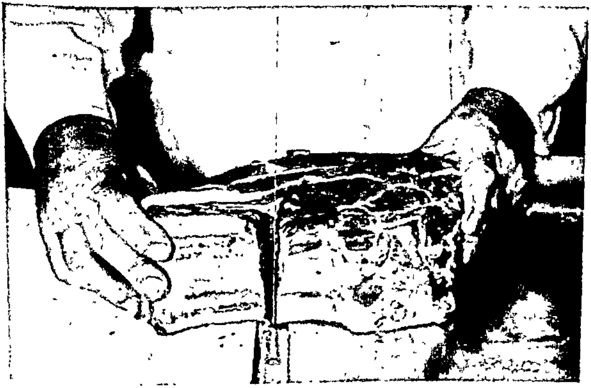

Fig. 10.12—Making a standing rib roast.

Power Cutting a Side of Beef

Fig. 10.9—Dividing the fore shank into shin soup bones.

Fig. 10.10—Removing the body of the chine bone from the rib.

Power Cutting a Side of Beef

Fig 10 15—Removing the neck Use for making mince meat or ground beef

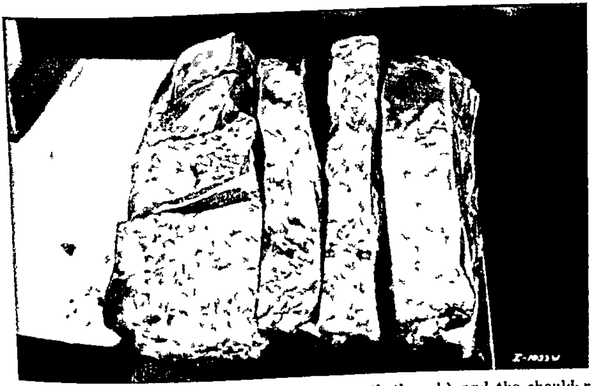

Fig 10 16—Showing the chuck roasts (cut with the rib) and the shoulder pot roasts (cut across) as they can be cut from the remainder of the chuck after the arm roasts or steak have been removed

Power Cutting a Side of Beef

Fig. 10.13—Cutting chuck or blade roasts. Roasts should not be less than 2 to 2½ inches thick. The flat end of the 4th and 5th chuck rib is the English cut used for braising as in short ribs.

Fig. 10.14—Cutting arm roasts and arm steak. Arm steaks make good swiss steak.

Power Cutting a Side of Beef

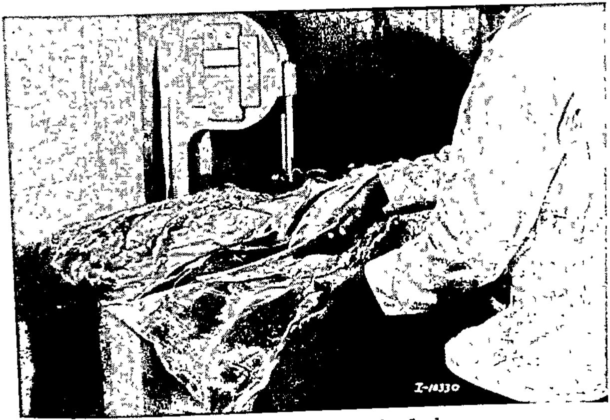

Fig. 10.19—Cutting off the flank

Fig. 10.20—Separating the round from the rump and loin. The cut runs almost parallel with the aitchbone.

Power Cutting a Side of Beef

Fig. 10.17—Cutting the heavy center cut chuck ribs into chuck roasts. At left is chine bone that can be used as soup bone or boned out for ground meat.

Hind Quarter

Fig. 10.18—Removing the kidney or knob.

Power Cutting a Side of Beef

Fig 10 23—Cutting porterhouse steak from the short loin Those having a small amount of tenderloin toward the rib end are called T steak

Fig 10 24—A short loin with the short tender fillet removed and the flank end being cut off making a "strip short loin"

Power Cutting a Side of Beef

Fig. 10.21—Separating the rump from the loin between the 5th and 6th sacral joints and 2 fingers width from the end of the aitchbone.

Fig. 10.22—Cutting sirloin steak from the hip end of the loin.

Power Cutting a Side of Beef

Fig 10 27—Cutting a rump roast, bone in, by first removing the tail bone (left), then sawing with the aitchbone

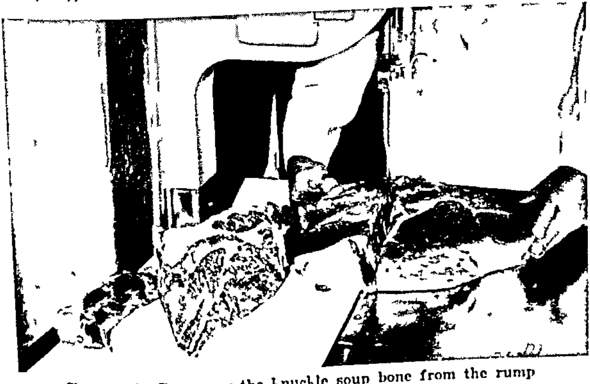

Fig 10 28—Removing the knuckle soup bone from the rump

Power Cutting a Side of Beef

Fig. 10.25—The main body of the vertebrae or chine being removed from the strip short loin.

Fig. 10.26—Cutting sirloin strip steak from the strip short loin. These steaks are easier to wrap than the same section cut as porterhouse. They also make nicer servings.

Power Cutting a Side of Beef

Fig 10 31—Separating the 'heel of the round (a pot roast) from the hind shank The shank is boned out for ground meat or cut into shin soup bones The flank (not shown) is handled as illustrated in Chapter XVI, 'The Beef Carcass and Its Cuts

The freezer storage life of fresh sausage can be lengthened by omitting the seasoning doing the seasoning after it is thawed The addition of an antioxidant such as Tenox 2 inhibits oxidation and may be added to the sausage at the second grinding Pork trimmings can be frozen for future sausage making, but the holding period should not exceed one month Smoked sausage has longer storage life than fresh sausage

Liver pudding, pon haus, and scrapple can be frozen, but the frozen product is inferior to the fresh It is preferable to cover the pans or crocks containing the products with a half inch of hot lard and place them under refrigeration

PREPARING AND FREEZING POULTRY

Broilers and fryers are cut into halves or quarters, and fowl can be left whole for roasting, cut into stewing joints, or boned Cut up fowl is popular because second joints, drum sticks, and white meat can be packed separate from the less desirable wings, backs, and necks It has the added advantage of compactness,

Power Cutting a Side of Beef

Fig. 10.29—Cutting round steak. For locker purposes as well as sales purposes, they should be divided into top or inside round (tray-top left), bottom or outside round (top-right) and round tip (bottom on tray).

Fig. 10.30—Cut round steak down to stifle joint and remove the round knuckle soup bone as illustrated.

to a minimum. It is necessary, therefore, to wrap the eviscerated fish, either in the round (unsplit) or the fillet, in plastic film, excluding as much air as possible and freezing it at 0° F. or below. Fish that are too large to be wrapped should be quick-frozen and dipped in cold water several times to cover them with a glaze of

Storage Period for Frozen Fish

Species	Round or headed and gutted	Wrapped, packaged
Mackerel (Spanish and Boston) Rockfish, Seatrout, Salmon	6- 8 months	8-10 months
Croakers, Grouper, Lakeherring Lingcod, Mullet, Rosefish (Ocean perch) Red Snapper, Sablefish, Shrimp	6- 8 months	8-10 months
Cod, Flounders (Sole), Haddock Halibut, Porgie (scup), Pollock Pike (all species), Sole, Whiting	8-10 months	10-12 months
Smelt, Whitefish	8-10 months	8-10 months

ice. The ice glaze will evaporate within several months unless the humidity of the holding room is very high. Reglazing or wrapping in moisture-vapor-proof material is then necessary. Frozen fish that has been well wrapped can be stored with other foods without imparting or transferring any odor or flavor to them.

HOME FREEZER STORAGE UNITS

Home freezer units are made in three popular styles referred to as: (1) the vertical, upright, or side door type, (2) the horizontal, top door, or cabinet type, and (3) the refrigerator with built in zero compartment. The latter far outnumber the other two types, having been universally adopted by manufacturers of all the popular makes of household refrigerators.

The side door type has the outward appearance of the regular household refrigerator but the freezing element circulates through pipes between the walls, and in some models the pipes are in the shelves, making the shelf a freezer plate. The shelves are at a convenient height for easy access and visibility; the depth of the shelves does not require long arms or the use of tongs, and the space can be utilized efficiently. This model has been criticized by some for door leakage and spilling of cold air whenever the door is opened.

eliminating the large body cavity which traps considerable air, thus requiring less storage space. Roasters frozen whole should have the excess internal fat removed as it will oxidize and become rancid far more rapidly than the rest of the fowl. Wrap the giblets in cellophane or foil and place inside the bird.

In large scale operations, poultry, turkey, ducks, geese, and other fowl are usually vacuum packed by placing the fowl in a CryOvac bag and exhausting the air by the use of a vacuum pump. The end of the bag is then made air-tight by placing a metal clamp around the opening. It is then immersed in hot water to give it a skin tight shrink. Zero storage will keep properly wrapped fowl edible for 4 to 6 months.

FREEZING EGGS

Eggs may be frozen whole or as separate whites and yolks but they must be stirred enough to break the membranes but not enough to cause foaming. Freeze only strictly fresh eggs. Break each egg individually into a cup and, if sound, put it into a container with the good eggs. It requires eight broken eggs to fill a pint cup and they will weigh about a pound. Add one tablespoonful of corn syrup, honey, or sugar, or one teaspoonful of salt (depending upon how the eggs are to be used) to each two cups of broken whole eggs or broken egg yolks, stirring it in gently. This is necessary to prevent the eggs from becoming gummy. Use the best container available, one that is liquid-tight. They can be held at 0° F. for one year. Thaw them in the container before using. Do not freeze cooked eggs as they become tough and rubbery.

FREEZING FISH

Fish, including shell fish, can be divided into two main groups based on the oil content of the flesh. The non-oily fish (less than 3% oil) store their oil in the liver rather than in the flesh and are represented by the cod, haddock, halibut, and swordfish, to mention a few. The fatty group (over 3% oil) have the oil distributed throughout the flesh. Some representatives of this group are herring, mackerel and salmon.

The chief type of spoilage in frozen fish, as in warm blooded animals, is caused by the oxidation of the fats resulting in rancidity. The action of bacteria and enzymes is inhibited by low temperatures, but air must be excluded if oxidation is to be held

rapid development of the home freezer cabinet and particularly the standard refrigerator with a freezer compartment was a hard blow to the locker operator. However, no one could say that the patrons enjoyed making trips to the locker plant to get their frozen meats. It is far more convenient to have their freezers in their homes. Quantity buying of meat is not for the average consumer who is limited in funds and experience. Daily or weekly buying is their forte.

Now with the freezer in her own kitchen and the wide selection of pre-cut meats available, the homemaker has a new sense of freedom. She is a great follower of specials. Specials on fresh meats, frozen vegetables, detergents, etc., keep her in fighting trim. Aluminum foil is her handy man. With zero temperature and her handy man, she has it made, as they say.

For those who wish to buy quarters or whole carcasses or have animals of their own raising to be processed, the complete service locker plant is still a useful institution.

Average Service Charges

Locker rental per year			\$10 to \$20
Meat processing charge per pound			
Chilling, cutting, wrapping, and freezing			.05 to .08
Grinding			.02 to .04
Rendering lard			.04 to .06
Curing meat			.04 to .08
Smoking meat			.02 to .05
Processing and freezing fruits and vegetables			.03 to .05
Freezing fruits and vegetables			.02 to .03
Butchering charge per head			
Hogs .			\$2.00 to \$4.00
Cattle .			3.00 to 6.00
Sheep .			1.50 to 2.50
Brokerage fee per pound for buying meat			.02 to .03
Processing charge for poultry, per fowl	Fryers	Hens	Turkeys
Killing and processing	.15 to .25	.17 to .27	.20 to .60
Processing only . (Chilling, wrapping, freezing)	.05 to .15	.06 to .16	.15 to .35
Processing, wrapping, and freezing fish (per lb.)			.05

The top door (dunk-in) type has the advantage of less door leakage and practically no spillage of cold air but has the disadvantage of requiring reaching and stooping, and the food is rather inaccessible without considerable rearrangement. It also utilizes more floor space than the side door type. Most of them are designed with a —10° F. sharp freeze compartment and a zero storage compartment. Both side and top door types are made in popular sizes ranging from ten to fifty cubic feet capacity at prices varying from $25 to $60 per cubic foot.

Walk-in Storage Units

Manufactured units of this type usually are prefabricated at the plant and assembled on the owner's premises. The more popular practice is to buy the refrigerating unit and have local labor construct the refrigerator. This permits the owner a wider choice in capacity, and generally it is cheaper. The plan is to have a 35° room either with four inches of cork, two to three inches of spun glass, or twelve inches of planer shavings for insulation, and a zero room with six to eight inches of cork, four inches of spun glass, or eighteen inches of planer shavings for insulation. Another type consists of a 35° room in which a cabinet freezer is built. Single refrigerating machinery operated by a ½ to ¾ h.p. motor is proving satisfactory but it is advisable, whenever possible, to have a separate machine for each box. This will save closing down the plant in case one unit goes bad. Freon 12 gas is probably the most satisfactory refrigerant to use and forced air cooling units that are self defrosting are in equal favor with gravity units. Sizes of 400 to 1200 cubic feet capacity best suit the needs of farm families.

COMMERCIAL LOCKER STORAGE

The great increase in the number of home freezer units has made it necessary for the locker operator to increase his services and add frozen foods and food freezers as part of his stock in trade. In 1952, about two thirds of the locker plants sold commercial frozen foods and had some bulk zero storage space.

Since 1952 there has been a gradual decrease in the number of locker plants. More space has been converted to zero bulk storage because of a decrease in locker patronage. Since 1952, approximately 2800 plants have ceased to operate as locker plants and have converted to bulk zero storage and ice making. The

XI.

DRESSING POULTRY AND GAME

The specialized breeding and feeding plants in operation for the production of poultry meat furnish a very minor part of the overall poultry meat supply in the United States. The chief supply is really a by-product of the egg industry, such as cockerels, cull pullets, and discarded layers. The supply of live and dressed poultry and turkeys is greatest during the late fall months, but the successful freezer storage of dressed poultry keeps the prices on a rather steady plane. It is necessary to have 200 to 300 million pounds of poultry in cold storage in January to supply the demand for the remainder of the year.

An Act of Congress passed in 1935 made the marketing of live poultry subject to the provisions of the Packers and Stockyards Act of 1921. Inspection service may be secured from the U. S. Department of Agriculture but is not mandatory. The same is true of the grading service.

Since January 1, 1949, all poultry and poultry products moving in interstate or foreign commerce or in designated major consuming areas has been federally inspected for wholesomeness under the Poultry Products Inspection Act. The service is free.

Chickens

Light broilers—Young chickens weighing 1 to 2¼ pounds.
Heavy broilers—Young chickens weighing 2¼ to 3¼ pounds.
Leghorn broilers—Young chickens of all light breed varieties.
Springers or fryers—Young chickens weighing 3¼ to 4¼ pounds.
Roasters—Young chickens weighing 4¼ pounds and over.
Stags—Young males developing hardened spurs but used for roasters.

Types of Service Plants

Limited Service—This type is concerned primarily in furnishing locker storage. It consists of a zero room where the patrons themselves place their products. Some plants have a —10° to —20° F. sharp freeze room and all patrons must present their produce for sharp freezing for which a one to two cent per pound fee is charged. Under this practice, the locker operator places the frozen food in the patron's locker. Suitable paper and containers are carried in stock for sale to the patron.

Extended Service—More and more plants are adding additional services for their patrons and these may include some of the following: butchering in the plant or on the farm, cutting, wrapping, labeling, grinding, sharp freezing, rendering lard, curing, smoking, blanching, packing and freezing vegetables, buying and processing for sale under their own brand, selling carcasses on commission, operating retail sales room in conjunction with locker plant, selling wrapping materials and cartons, selling branded frozen food products, renting bulk storage, storing furs, processing fruits for patrons or under their own brand name for sale to the public, and the sale of refrigerators, freeze cabinets, and other appliances.

Processing and Storage—In addition to locker rentals, which is a side line in this instance, these plants contract with growers for special crops indigenous to that locality and make their processing and sale under a brand name the main business of the plant. Bulk cold storage is sometimes stressed, particularly in large fruit growing areas.

Legislation

Most states have specific laws governing locker plants. Iowa adopted the first locker plant law in 1939. The legislation deals with sanitation, owner and renter responsibilities, specifications in equipment requirements, chill room and locker room temperatures, health certificates, and inspection. The license fees vary from $5 to $15 for 200-locker capacity or less, with $1 to $5 additional for each extra 100 lockers.

blue Produce what the market demands and not what is convenient at the time, is good advice to follow

Handling Previous to Dressing

Birds, like animals, should receive careful handling to avoid bruises, abrasions and broken limbs The holding pens should be cool and well ventilated, and the birds should have free access to water Water is a heat regulator and helps the bird to eliminate waste products Birds denied water for too long a time lose weight and dress rather soft Feed should be withheld for 18 to 24 hours before the chickens are killed, since a bird full of feed will not bleed as well, will be harder to eviscerate, and the full crop is unsightly and wasteful in an undrawn bird

Catch the fowl by the leg below the thigh and do not allow it to strike its breast on a hard surface Holding one wing when picking up a bird by the shank will prevent struggling Overheated, over excited birds will bleed poorly, producing a carcass of higher blood content and lower keeping quality

Tools and Equipment

The old method of chopping off the head of the fowl with a hatchet or cleaver and tossing the headless bird into a barrel, one on top of the other, as rapidly as the beheader could swing the hatchet, was considered the acme of speed But this practice disappeared into the limbo as science streamlined and mechanized the commercial dressing practices of animal and fowl In fact, the mechanical processing of fowl was patterned very closely after the methods employed by the meat packing industry in the slaughter of hogs The commercial poultry processing plant has overhead tracks (much lighter in structure and lower than those used for animals) which take the form of a belt chain to which oval link chains are suspended to hold the shackles for suspending the bird These belt chains move at a controlled speed in the same manner as those employed for hogs Other equipment consists of bleeding tubs, scalding tubs, automatic pickers, wax dipping tanks, tubs for catching the feathers, plucking tables, drawing tables, and cooling racks

Where only a few birds are dressed, the equipment consists of a scalding tub, a shackle for holding the bird, and probably a bleeding cup The knives necessary in each case are a sticking knife (a 3 inch blade for chickens and a 4 inch blade for turkeys), pinning knife (a paring knife will do), several sizes of boning

Roosters or cocks—Males with decidedly mature spurs and comb growth.

Heavy pullets—Pullets of heavy breeds over 4 pounds and before they come into egg production.

Heavy fowls, colored fowls, stewing chickens—Matured female chickens of all heavy breeds too mature for roasters.

Young fowls—Pullets in production several months and in good feather condition.

Leghorn fowls—Hens of all light weight breeds.

Capons (light)—Less than 7 pounds (unsexed males).

Capons (heavy)—Over 7 pounds.

Turkeys

Pullets or young hens—Females less than one year old, and before they have laid many or any eggs.

Cockerels or young toms—Males less than a year old, and before they become staggy.

Breeder hens and breeder toms—Turkeys used for breeders and usually marketed from April to August, before they molt or when in molt.

Old hens—Females over one year old, after molt is completed.

Old toms—Males over one year old, after molt is completed.

Ducks and Geese

Green ducks and geese—Fat ducks and geese not over 16 weeks of age.

Farm ducks—Ungraded ducks.

Young geese—Less than one year of age.

Old geese—Over one year of age.

DRESSING POULTRY

Selection of Birds for Dressing

The value of poultry and turkey for meat varies considerably with the breed. Some are thin meated, some are deep sided and rangy, while others are thick meated and particularly full breasted. The thick meated, full breasted, well finished bird will be a top grade bird on any market provided it has been properly dressed. To avoid having too many birds of the lower grades, the thin chickens should be put on a fattening ration for another week. Turkeys should be fed until the skin no longer appears

approved and most widely practiced method employed today. The bird is suspended by the legs with shackles, made of heavy wire, which not only hold the feet in the V-shaped vise but also spread the legs. The use of a sash cord with a 2 inch square wooden block attached is a simple homemade shackle but it leaves one leg free. The feet of the fowl should be level with the eyes of the worker for convenience of operation.

Grasp the head and hold it firmly in the left hand (if you are right handed), pressing the thumb and forefinger on both sides of the junction of the upper and lower beaks. This forces the mouth open so the point of the sticking knife can be inserted, sharp edge downward, to the base of the skull. Press the point of the knife into the flesh, lift the handle upward, and cut downward and to the right, severing the veins. If a good bleed does not result, try again until there is free bleeding.

Dry Picking

If the fowl is to be dry picked, hold the head of the bird in the same position, insert the knife blade (blade edge up) into the cleft in the roof of the mouth and force it through to the rear lobe of the brain (medulla oblongata). The chicken gives a peculiar squawk if properly debrained, whereas the turkey relaxes its wings and the main tail feathers spread out fan shaped. The puncturing of the brain relaxes the feather muscles, causing the feathers to become loose and easily plucked. This condition lasts for two to three minutes when the muscles again begin to tighten up due to rigor mortis, making it necessary to have rapid and orderly plucking. "Roughing" the bird before the muscles reset is the process of removing the major part of the plumage in the order in which the parts of the bird bleed out. It consists of twisting out the tail and main wing feathers, plucking the breast, neck, back, thighs, and legs. This is followed by the more tedious task of pinning. The object is to so pluck and handle the bird that the outside layer of skin is free from tears, abrasions, or bruise spots and maintains its natural bloom. Dry picking has been largely replaced by semi-scalding.

Scalding Practices

Hard or Hot Scalding

Hard or hot scalding is one of the earliest methods used for the quick removal of the feathers. It is still the common practice employed in home dressing birds of all kinds. The speed at which

knives ($3\frac{1}{2}$ to 6 inch blades) for eviscerating, a linoleum knife for splitting the back (or a power meat saw, if available), a thermometer for testing water temperature, and a bone shears for severing heads, necks, and shanks. Although the blades of the knives used for sticking and braining are narrow bladed ($\frac{1}{2}$ inch wide), the handles should be of standard grip.

Bleeding Practices

1. Severing the neck (chopping block method or barrel method).

2. Cutting the throat (kosher method). Make the cut on the outside.

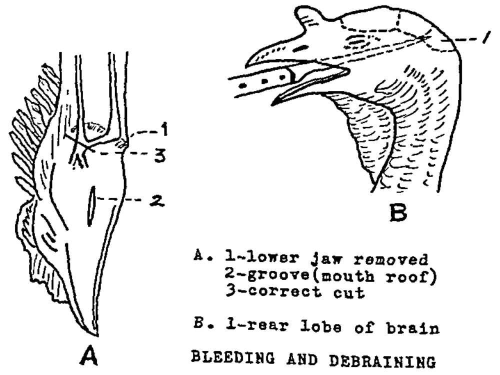

Fig. 11.1—

3. Dislocating the neck (simple and sanitary but not recommended except for home use). It is accomplished by placing the thumb on the top of the neck in back of the comb and the fingers under the lower jaw. Give a quick downward pull and a backward jerk of the head by compressing the third and fourth finger in the opposite direction to the thumb.

4. Cutting the throat inside the bird's mouth. This is the

Fig. 11.3—Applying the head wrap.

Fig. 11.2—Roughing. (All poultry photos by courtesy of The Pennsylvania State University.)

feathers are loosened is dependent upon the temperature of the water and the period of immersion. The hotter the water, the quicker the feathers are loosened. But the temperature of the water to use also is dependent upon the age and nature of the fowl to be scalded. Young birds with tender skins should not be scalded in water over 150° F., whereas mature birds scald well at 155° to 160° F. Mature fowl can be scalded in water around 185° F., but the immersion period must be short to avoid cooking the skin. When high scalding temperatures are used, it is well to immerse the scalded bird in cold water as soon as the feathers are loosened. This stops further scalding action.

The hot scald works well on birds having a large number of pin feathers. The practice gives good results if the operator is careful not to overscald. The latter causes the skin to tear and discolor and gives the bird a cooked appearance, producing a carcass that lacks bloom and turns brown rapidly. Fat birds will hold their natural color longer because the melted fat forms a film over the skin, excludes the air, and retards dessication. Where a deep yellow color is desired on fat birds of the yellow skinned variety, it is a practice to dip the dressed fowl into boiling water and then douse it immediately into cold water. The hot water melts the fat and draws it, along with the yellow pigment, to the surface of the skin. The cold water causes the fat to harden and the color to set in the fat. Hot scalding is not practiced on birds destined for the regular markets.

SEMI-SCALDING (SLACK SCALDING)

This method was developed in the late twenties and is now universally used in all the large poultry packing plants. It lends itself well to mechanization and has the advantage of lower labor cost. The appearance of the birds is improved and they do not turn red or brown but retain a natural bloom. This incidentally throws more birds into the higher grades, resulting in greater financial return.

The temperature of the water should be 125° to 126° F. for young, tender skinned birds, 127° to 128° F. for roasters and young turkeys, and 130° to 132° F. for the aged birds. These temperatures do not loosen the feathers as much or as rapidly as the hot scald but neither do they cook or cause the outer skin to peel. Because the skin is not weakened in strength, this type of scalding makes it possible to use the mechanical picker. These picking machines consist of a drum upon whose circumference

Fig. 11.4—Blood and feather dressed.

The period of immersion varies from 20 to 30 seconds for broilers up to forty seconds for older birds. The birds should be suspended from shackles, if plucked by hand, and the plucking cannot be done by rubbing as in the hot scald method. The feathers must be pulled out in tufts as in dry picking. The scalding vats should be equipped with thermostatically controlled steam jets in order to keep the desired water temperature.

Wax Picking

This works very well with the semi-scald method and is usually employed in combination with it. After the birds are roughed on the picking machine, they are dried by passing them through a drying machine. The wax will stick to the dry feathers and stubs more tightly than it will to wet feathers.

The dried birds are then dipped, by hand or automatically, into a preparation of melted wax (patented) at a temperature of 125° to 130° F. for a period of 30 to 60 seconds. When birds are moving along a processing rail, the buckets containing the heated wax moves up and envelops the bird that is suspended by the head and feet. This specially prepared wax has a melting point of around 120° F. and is hardened by passing the bird under a cold water spray or through a cool air blast. The hardened wax is then pulled from the bird with the feathers, pin feathers, hair, and

Fig. 11.7—The use of a tendon puller.

are mounted innumerable suction tubes made of rubber. As the drum revolves, the semi-scalded birds are held against its outer surface and the feathers are rubbed off.

Fig. 11.5—Picking machine.

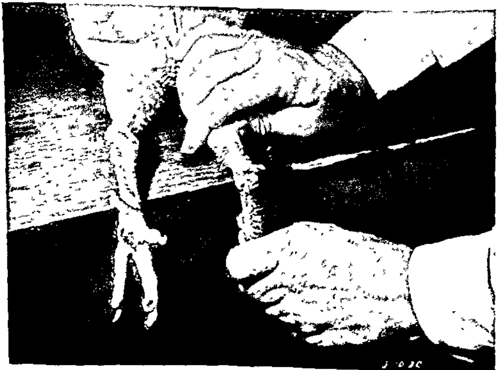

Fig. 11.6—Breaking the shank bone preparatory to pulling the tendons.

move the head. Peel back the skin on the neck and sever the neck close to the shoulders (use the bone shears). (2) Remove the crop and windpipe by hooking the short gullet (between crop and gullet) with the index finger and peeling the crop loose from the skin by working it forward. (3) Use the index finger to loosen the lungs from the chest wall by inserting it between the wish

Fig. 11.9—Cutting around the vent with the opening made to the rear of the keel bone.

bones. (4) Remove the feet at the hock joint. (5) Make an incision from the rear end of the keel bone to the rectum and cut around the rectum. (6) Draw the intestinal tract, including heart, lungs, and liver through this opening. Chilled or partially chilled birds are easier to draw than warm ones. (7) Remove the bile sac from the liver. (8) Split along the edge of the fleshy part of the gizzard sufficiently deep to cut the muscle but not the inner lining. The pressure of both thumbs pulling the halves apart will permit peeling without breaking the lining and spilling the contents of the gizzard. Gizzards are easier to peel if they have been partially chilled in ice water.

The bird should be shaped to give it a plump, compact appearance. The wings are compressed against the sides of the carcass and the legs are brought together at the vent. A length of

scale encased in it, producing an attractively dressed product. This wax is renovated for reuse by boiling out the water (if water spray was used for cooling) and straining off the feathers.

Fig. 11.8—Removing the crop.

Chilling and Storing

The immediate removal of body heat by subjecting the birds to a temperature of 32° to 36° F. is highly essential. Freezing warm birds before the animal heat has been removed is to be avoided. If artificial refrigeration is not available, the next best thing is to place the birds in tubs of ice water. This plumps the bird and chills it but it also lowers its keeping quality and is not advocated excepting in an emergency for holding the birds over night.

When thoroughly chilled, the heads of the birds should be wrapped with paper, the wings tied against the body, and the birds packed in paper lined boxes or barrels for shipment. The entire discussion to this point has been on birds that are designated as blood and feather dressed.

Full Dressing

Birds that are to be frozen should be full dressed. The different operations in their proper order are as follows: (1) Re-

cord is drawn over the fore part of the breast and over the wings and crossed over the back, brought over the ends of the drumsticks, and tied tightly at the back of the rump. This style of trussing is employed on a bird for roasting.

Broilers and springers receive a different treatment. Use the linoleum knife to cut along either side of the back bone, beginning at the rear and cutting forward. This leaves the backbone and neck in one piece. Remove the neck with a bone shears. The two halves of the fowl are laid open sufficiently to remove the entrails. Split through the breast with a cleaver, or preferably a power saw, to halve the bird. The halves can be quartered, if desired.

There has been a popular trend on the part of the buying public for cut up chicken which enables a consumer to buy any part of a chicken. This is popular because they are not compelled to buy parts they do not like in order to get the parts they want. The cuts in order of their monetary value are breasts, thighs (also divided into second joints and drumsticks), wings, backs, necks, and gizzards. The livers and hearts bring a good price.

Fig. 11.12—Completing the trussing.

Fig. 11.10—Removing the entrails.

Fig.11.11—The first step in trussing.

Fig. 11.14—Making the opening cut on the fleshy side of the gizzard

meat into which the boneless dark and white meat was divided. They went a step further and took the small trimmings from around the joints and off the back and flanks and added them to the smaller pieces of white meat until they had the proper weight steak. This mixture was run through the steak machine which tenderized and kneaded the pieces into a single steak. The yield of cuts from a 26 pound drawn turkey handled in this manner was 46 five ounce steaks, 2½ pounds of wings, 2½ pounds of neck, and about 1 pound of giblets. The wings, necks, giblets, and skin find a ready sale for making soup stock or as individual pieces.

Half and Quarter Turkey

Halving a bird and roasting one-half with the filling underneath has been well received.

Quartering a large bird by making the division mid-way between the wing and leg is a practice that works out well for small families. The idea that turkey is something that must be roasted has more or less retarded the sale of "cut up" turkey.

Fig. 11.13—Opening the back by splitting along either side of the backbone. The side can be quartered, if desired.

Fabricated Turkey

Turkey Steak

The utilization of large tom turkeys for roasting is not practical in most American homes. Their chief outlet is to the hotel and restaurant trade. To widen the market for large toms and keep their price more in line with hen turkeys which better meet the weight requirements of the average family, several variations of cutting the meat into steak have been devised by investigators.

The Douthit Method—Reported to have been developed by H. K. Douthit of the Nebraska School of Agriculture at Curtis, Nebraska, this type of steak entails the use of a power meat saw and a frozen turkey. The wings, drumsticks, and thighs are removed and the steaks are made by cutting crossways through the breast, making the steaks ½ to ¾ of an inch thick. The objection to this method is the low percentage of steak yield to the rest of the carcass, making the cost of the steak too high for the average consumer.

The Beanblossom Method—Professor F. Z. Beanblossom and his co-workers at Texas A & M College developed the idea of skinning and boning the turkey and utilizing the steak maker, a machine that both knits and tenderizes the 4 to 6 ounce portions of

Fig. 11.17—Second—Removing the leg.

Fig. 11.18—Remove the tail piece (not shown). Fourth—Separating the rib and neck piece from the breast.

Fig. 11.15—Peeling the gizzard.

Fig. 11.16—Cut-up chicken. First—Removing the wing.

Dressing Percent

The overnight fasting shrink varies from 2% in chickens to 3% in turkeys.

The dressing loss, whether blood and feather dressed or full-dressed, depends upon the weight and condition of the bird. Chickens under 5 pounds will lose an average of 11% blood and feather dressed as against 25% full-dressed. Chickens over 5 pounds will average 7% and 18% loss respectively. Male turkeys weighing between 13-17 pounds will lose an average of 10% blood and feather dressed and those over 20 pounds will lose about 8%. The same birds full dressed will average a loss of 23% and 24% respectively. Blood and feather dressed female turkeys weighing under 10 pounds average 10% loss, those between 10 and 12 pounds average 9%, and those weighing between 12 and 15 pounds average 7½% loss. These same birds will show a full-dressed loss of approximately 24% to 25% or slightly more than the toms.

DUCKS AND GEESE

Water fowl are very tight feathered, which makes them difficult to scald. It is necessary therefore to steam them. This is accomplished by churning them in water that is near the boiling point or wrapping a burlap sack around the birds and immersing them in hot water. Water temperatures as low as 160° F. can be used but the scalding time is considerably longer.

Properly bled and debrained waterfowl are easily dry picked but the fine down feathers must be removed by scalding or waxing. Waxing destroys the value of the down feathers and is employed after most of the down has been otherwise removed.

Long Island has been a large production center for green ducks (8 to 12 weeks of age), and therefore Long Island Ducklings have become a legend among connoisseurs of food.

GUINEA FOWL AND PHEASANT

Most guineas are dressed in the same manner as chicken—dry picked or semi-scalded. The young birds are marketed at dressed weights of two pounds or under.

Pheasants are probably one of the meatiest birds for their size of any bird used for human consumption. They are marketed blood and feather dressed or full dressed, generally dry picked.

Fig. 11.19—Fifth—Dividing the breast into two sections.

Fig. 11.20—The cut-up chicken.

4. Turkeys with dirty feet are considered below grade.

5. Turkeys with dirty vents are considered below grade.

6. Turkeys with dirty or bloody heads or bodies are considered below grade.

7. No skin pigmentation is permitted in U. S. Grade AA. It is permitted only on the tail of a U. S. Grade A bird, and no further than over the hips on a U. S. Grade B bird.

8. Turkeys showing callouses on the breast bone are not permitted in U. S. Grade AA. If of a slight character and not more than one inch in length, they may be permitted in U. S. Grade A. If not over three inches in length and not too dark, they may be permitted in U. S. Grade B.

9. Turkeys with improper head wraps or head wrapping may be graded only when the grader is certain this condition will be corrected before the birds are packed.

Ice packed dressed turkeys without head wraps may be included in the grades of U. S. Grade A, U. S. Grade B, and U. S. Grade C, provided that the heads have been carefully and thoroughly cleaned of blood, so that there is no appreciable soiling of dressed carcasses with which the heads may come into contact.

10. An individual turkey may be marked with a tag showing the proper U. S. grade only when it has been graded by a grader authorized by the U. S. Department of Agriculture.

11. Individual turkeys may be marked with U. S. Grade only when grade tags or labels approved by the U. S. Department of Agriculture are used and are attached to the birds in an approved manner.

12. When an individual turkey is tagged to indicate its U. S. Grade, the grade tag also must state the age; that is, whether the bird is "young" or "old."

13. A package in which officially graded birds are packed may be stamped with the proper U. S. Grade whether or not the individual birds in the package are labeled with a U. S. Grade.

14. All turkeys packed in the same container must be of the same class, grade, color, and within the same weight class except that birds of different classes, grades, or weight classes may be packed together provided the number of birds of each class and grade is plainly marked on the outside of the package.

15. Turkeys shall be labeled with U. S. Grade tags only by the authorized grader who graded them or by persons under his direct supervision.

They weigh from 1 to 2 pounds in the carcass, and the major portion of the meat is on the breast. The bones are quite small in proportion to the amount of edible meat.

U. S. STANDARD GRADES

Chickens

Dressed broilers, fryers and roasters—U. S. Grade AA, A, B. and C.
Dressed capons—U. S. Grade AA, A, B, and C.
Dressed stags and cocks—U. S. Grade A, B, and C.
Dressed fowl or stewing chicken—U. S. Grade AA, A, B, and C.

Turkeys

Dressed young hen turkeys—U. S. Grade AA, A, B, and C.
Dressed young tom—U. S. Grade AA, A, B, and C.
Dressed old hen and old tom—U. S. Grade AA, A, B, and C.

General Grading Requirements

1. Any turkey that has feed in its crop will be considered as below grade. Turkeys with crop properly washed out or with crop properly removed (the entire crop removed through a short incision of the skin at the back and side of the neck), either sewn or unsewn, may be included in the grades of U. S. Grade A, U. S. Grade B, and U. S. Grade C, provided they otherwise meet the requirements of those grades and provided that there is no appreciable leakage of feed materials into the crop cavity.

2. All feathers, including the neck feathers above the head wrap, garters around the knees, and fan feathers on the wing tips, must be removed from the carcass or the bird will be considered as below grade, except that turkeys with fan feathers on the wing tips may be included in the grades of U. S. Grade A, U. S. Grade B, and U. S. Grade C, provided they otherwise meet the requirements of those grades and provided further that the fan feathers are free of blood or other foreign material.

3. Unsewn torn skin is not permitted in Grade AA, nor in U. S. Grade A. Unsewn torn skin is permitted in U. S. Grade B only, if on the back or back of wings, and if less than three inches in length. Open tears are permitted in U. S. Grade C. Turkeys with unsewn torn skin, except as such tears are permitted in U. S. Grade B and U. S. Grade C, must be lowered one grade.

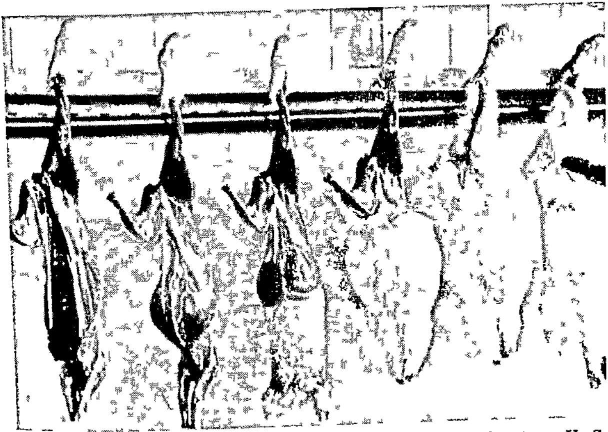

Fig 11 21—The procedure followed in skinning a rabbit. (Courtesy, U. S Wild Life)

The carcass is jointed by removing the fore and hind legs, cutting the loin in one piece, and separating the shoulders.

Rabbit pelts have a fur skin value and small ones should be stretched on a thin board or wire stretcher 24 inches long and 4 inches wide at the narrow end and 7 inches wide at the base The skins of 10 and 12 pound rabbits need a board 30 inches long, 4 inches wide at the narrow end, and 9 inches wide at the base. Stretch the warm skin on the board with the fore part over the narrow end, and smooth out the wrinkles. Have both front legs on one side of the shaping board. Remove any surplus fat and make sure that the skin dries flat. Do not dry in the sun or artificial heat, and do not use salt. When dry the skins can be stored in a tight box, but each layer should be sprinkled with naphtha flakes to keep out moths.

An infectious disease known as tularemia is prevalent in wild rabbits and is communicable to man through abrasions in the skin while dressing a rabbit having the disease. It is transmitted from one rabbit to another by the rabbit louse or tick. The disease has not been observed in domestic rabbits and the germ is destroyed by cooking.

16. Each Government-authorized grader must have and use a poultry thermometer for taking internal temperatures.

17. Turkeys shall not be graded and marked or tagged with a U. S. Grade until they have been pre-cooled to an internal temperature of at least 36° F., unless the grader is sure they will be so cooled before packing.

18. A grading memorandum should be made out at each shipping point, regardless of the size of the lot, and a grading certificate issued on each carlot or less-than-carlot shipment.

19. Where turkeys which have been previously graded and regraded show discoloration of skin, darkening of flesh, and development of "off" condition of skin, due to holding in storage or during transit or warehousing, these characteristics shall be considered as factors of condition and not of grade. They shall not be considered in determining the grade upon regrading, but such condition factors must be noted on the grading certificate.

20. Turkeys that are dark or blistered or skin dried from freezing cannot be graded into the two top grades.

21. All turkeys must be free of any condition as evidenced by external appearance which would render them unwholesome for food.

RABBITS

Rabbits should not be lifted by the ears or legs but by grasping a fold of skin over the shoulders and then supporting the rump with the free hand, holding the back of the rabbit against the body.

The method of slaughter consists of (1) giving a sharp blow on the top of the head to stun it, (2) making an incision at the rear of the hock, between the bone and the tendon, (3) suspending by hanging on a hook through the hock, (4) severing the head at the atlas joint for a free bleed, (5) removing the free rear leg at the hock joint, (6) removing the tail and front legs (knee joint), (7) cutting the skin on the rear of the loose leg to the base of the tail and up the rear of the suspended leg, and (8) pulling the edges of the cut skin away from the flesh and down over the carcass. Do not make any other cuts in the skin. Eviscerate by opening the median line of the belly, leaving the heart, liver, and kidneys in the carcass. Remove the suspended rear leg and rinse the carcass in cold water to remove any hair or blood.

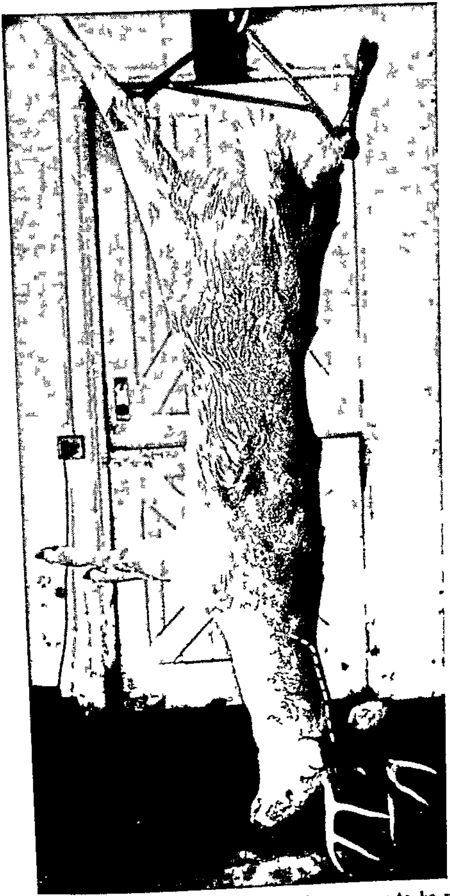

Fig 11 23—The white dotted line indicates the opening to be made when skinning out the cape for a head that is to be mounted (All venison photos by courtesy of The Pennsylvania State University)

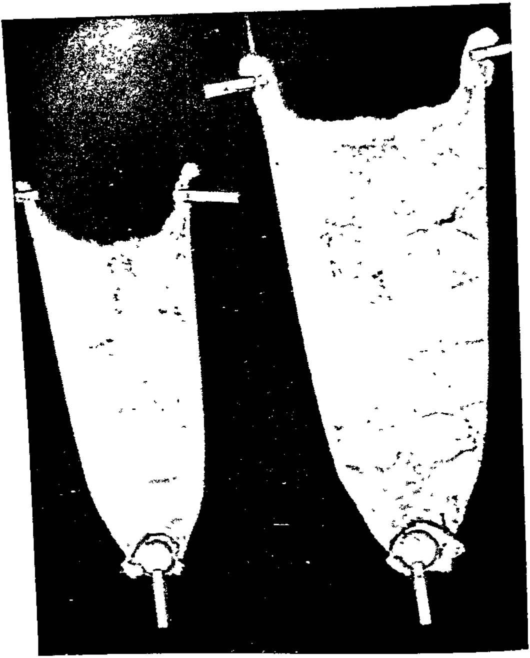

Fig. 11.22—Rabbit skins on wire stretchers. (Courtesy, U. S. Wild Life.)

VENISON

The preservation of game by legislation restricting the period when such game may be legally shot is making venison more abundant and therefore a more noticeable addition to the family larder. Its scarcity, however, makes it all the more obvious that

should be skinned unless it is to be hung and aged in the cold for a week. Leaving the skin on the carcass during aging holds down shrinkage and avoids discoloration. The aging temperature should be 32°-38° F.

Open the skin over the rear of the hock and down the back of the leg to the rectum. Skin around the hock and remove the leg at the break joint on the lower part of the hock. Make an opening between the tendon and the hock and insert a hog gambrel. Raise the carcass until the haunches are at shoulder height and proceed to pull the pelt from the rounds. Use the fist to remove the pelt from the sides and continue to pull it down the back. Remove the fore legs at the smooth joint (just below the knee joint). Very little knife work is necessary since the pelt can be pulled and fisted from the carcass. If the head is to be mounted, the skin on the neck (cape) should not be opened on the underside of the neck but should be opened along the crest of the neck.

The head is removed at the atlas joint, similar to the practice with all other animals. After the pelt and head have been removed, split the underside of the neck and remove the gullet and windpipe and the remainder of the pluck if this has not been done previously. Use a stiff brush and plenty of clean water to wash the hair and soil from the inside of the carcass. Place the carcass under refrigeration.

Care of Hide and Head

Rub the skin side with a liberal amount of fine salt and apply plenty of salt to the head. Let the salt be absorbed for 24 to 48 hours, then fold the pelt, hair side out, and tie securely with strong cord. Tag it according to law and ship it to a taxidermist for mounting and tanning. Use clean table salt to avoid mineral stains, particularly if the pelt is to be made into buckskin. Save time and money by discarding badly torn or scored pelts.

Cutting the Carcass

Split the carcass through the center of the backbone, dividing it into two sides. However, if the neck is to be used as a pot roast or neck slices, it should be removed before splitting the carcass. Place the side of venison on the table, inside down, and remove the haunch by cutting in front and close to the hip bone. Move forward to the shoulder and remove it by cutting between the fourth and fifth rib. The back with breast attached must

better care should be taken of the carcass to prevent the flagrant waste that is often evident in its preservation and utilization.

Precautions at Time of Kill

Having dropped the deer, approach it with caution and with gun ready for another shot. It may have been wounded and dropped simply from exhaustion. In that event, it may make another effort to get away, so play safe and place another shot through the neck. Keep out of reach of the legs until certain the deer is dead. Adhere to the state laws regarding tagging and reporting the kill.

Bleeding

Deer that have warmth in the carcass should be bled. Insert the blade of the hunting knife ($4\frac{1}{2}$-$5\frac{1}{2}$ inch blade) several inches in front of the point of the breast with the point of the blade aimed toward the tail. Plunge it up to the hilt, press the blade downward to the back bone, and withdraw it with a slicing motion. Elevate the rear portion of the deer to permit the blood to drain by gravity.

Removing Intestinal Tract

Place the animal on its back and block it on either side with small logs or rocks to keep it in place. Open up the midline of the body from the breast to the rectum. Split the pelvis, where the hind legs are joined, by making the cut with the white membrane that separates the two rounds. This leads to the fusion point on the pelvis which is easily split with a knife, unless the deer is aged, in which case the bone must be sawed. Cut around the rectum and remove all of the intestinal tract excepting the kidney and the pluck (heart, lungs, liver, gullet, and windpipe). This constitutes a hog dressed carcass with pluck in. Flush the blood and any dung out of the carcass with clear brook water. In case the pluck is removed to permit more rapid chilling, do not discard the heart and liver as they make nutritious and palatable dishes. The liver makes a good camp meat.

Skinning

The hog dressed deer generally is transported on the outside of the hunter's car to give mute evidence of his good fortune and to serve as refrigeration in transit. At journey's end, the deer

Fig 11 25—Pulling the pelt from the loin.

Fig. 11.24—The skin has been opened over the rear of the hock and haunch to the bung, and is being pulled from the haunch.

Fig 11 27—Using body weight to pull the pelt over the back and shoulder

Fig. 11.26—Fisting over the side can be done with the fist, the heel of a knife, or a skin bone.

have the breast removed. Cut across the ribs about 3 inches from the backbone on the blade end to the loin end. The ribs are separated from the loin by cutting directly behind the last rib. The leg is placed on the table, aitchbone on top. Cut parallel to the aitchbone and remove the rump. Remove the flank.

Venison round steaks are cut from the leg or round, and the heel is used for stewing or grinding. The rump, which also contains the hip loin, can be cut into hip steak. The shoulder is divided into the top, the arm, and the shank. The shanks and breast are boned and ground into deerburgers or incorporated with pork for summer sausage.

Mutilated or Bloodshot Areas

If a large area of the carcass is affected by the shot, it can be salvaged by washing it free from hair and soaking it in a weak brine made by dissolving ½ pound of salt in 1 gallon of water. The salt will draw out most of the blood overnight and the meat will be suitable for grinding or stewing. Badly mutilated meat makes good dog food.

Preserving Venison

Venison lends itself well to curing, drying, and smoking (dried venison); to corning (corned venison); to canning; to sausage making when mixed with 50% or more of fat pork trimmings and prepared as summer or smoked sausage.

Probably the most widely used method of preservation is by freezing and storing at zero. If this method is employed, the state regulations as to length of storage must be observed. In Pennsylvania, venison legally killed may be possessed for sixty days after the season closes. An extension permit to retain deer meat for four additional months can be secured for a fee of $1.00.

Corned Venison

Use boned shoulders and cut into 3 to 4 pound pieces. Place the meat in a stone crock. Dissolve 1½ pounds of salt, ½ pound of cane or brown sugar, 1 ounce of cream of tartar, 1 ounce of baking soda, and 1 ounce of pickling spice in 1 gallon of hot water. Allow the brine to cool before pouring it over the meat. Make enough pickle to cover the meat and weight it down with a clean board and a rock. Cure for several weeks.

Fig. 11.28—The full dressed carcass showing the aitchbones.

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Venison round steaks are cut from the leg or round, and the heel is used for stewing or grinding. The rump, which also contains the hip loin, can be cut into hip steak. The shoulder is divided into the top, the arm, and the shank. The shanks and breast are boned and ground into deerburgers or incorporated with pork for summer sausage.

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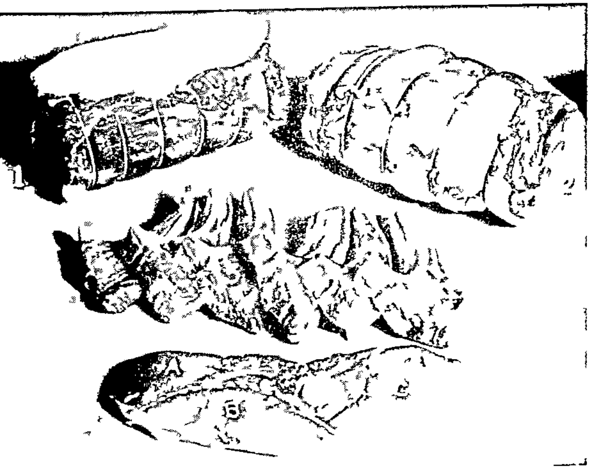
Fig. 11.28—The full dressed carcass showing the aitchbones.



ig 11 30—Some cuts of venison (1) Rolled shoulder of buck with slice of fresh pork fat for self basting, (2) rolled shoulder of fat doe (it has sufficient fat) (3) rib chop (4) venison round steak indicating A inside round, B outside round and C round tip

Dried Venison

Cure the muscles of the round separating them into inside, outside, and round tip Rub them with a mixture of 3 parts salt and 1 part of granulated sugar for three consecutive times at 4 to 5 day intervals Place the rubbed meat on a table or shelf in a cool cellar during the curing process, and at the end of three weeks brush off any remaining salt and hang the meat to smoke for three days Hang the smoked venison in a dry place for a month or more to dry, after which it can be sliced similar to dried beef

Sausage

One taste of sausage made from the less tender cuts of venison ground with fat pork trimmings will assure anyone that no part of the venison carcass should be wasted Mix the venison and pork in equal parts and season the same as sausage (6 ounces of salt, 1 ounce of pepper, and a pinch of sage for 20 pounds of sau-

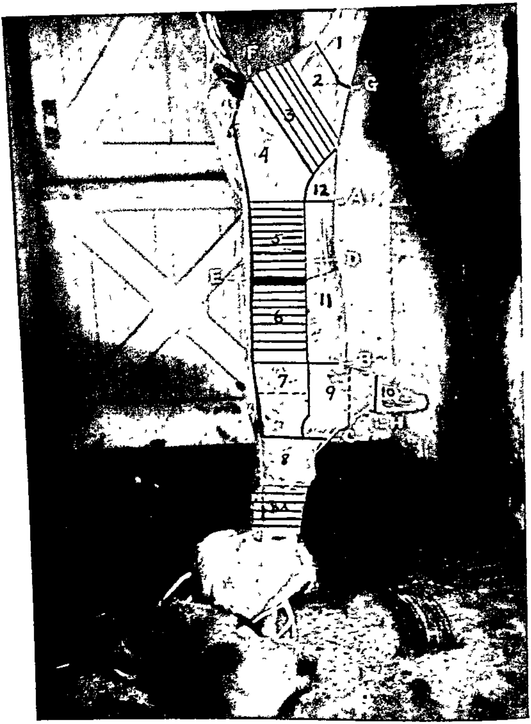


Fig. 11.29—One method of cutting a venison carcass: (1) rear shank; (2) heel; (3) round steak; (4) rump and hip loin; (5) loin chop or roast; (6) rib chop or roast; (7) top of shoulder or chuck; (8) neck pot roast; (8A) neck slices; (9) arm roast; (10) fore shank; (11) breast; (12) flank. The letters in white indicate the line where wholesale cuts are made. The above carcass weighed 92 pounds and was in excellent finish.

XII.

CURING AND TANNING HIDES AND PELTS

HANDLING PELTS

Large pelts are called hides, medium pelts are called kips, and small pelts are called skins. They are classified into two main groups, known as (1) packer and (2) country hides and skins. Further classification is based on the sex of the animal, the weight, brand, and locality in which it originated. The grades are No. 1, No. 2, and *glue stock.*

The ultimate destination of all pelts is the tannery. The condition of the pelt and the directness of marketing affect the price received by the farmer. Packers have a decided advantage in that (1) they deal directly with the tannery buyer, (2) their hides have a good take-off with a minimum of cuts and scores, and (3) they have large quantities of the different classes and grades with which to attract large buyers.

Since the hide is the most valuable by-product of cattle, the livestock producer should consider the hide as well as the flesh in his livestock management program. Lice, ticks, grubs, fleas, mange, scabies, pox, ringworm, and warts, most of which can be controlled by dipping, sorely lower the value of hides for leather; so do the branding iron, thorn and wire gashes, or horn and nail scores.

A man who deliberately allows large, hard clumps of dung to adhere to the hide; who fail to remove the dewclaws, sinews, lean, fat, lips, ears, and tail bone; who uses dirty salt or insufficient salt and allows the hide alternately to freeze and thaw; who is careless in removing the hide, making deep scores or cuts; a man who binds up the hide with baling wire (leaving a rust stain)—he is the man who makes country hide prices what they are.

sage meat). It can be stuffed in hog casings and smoked for 8 to 10 hours at 110° F. and held the same as cured pork, or it can be made into patties and canned. In case the sausage is to be frozen and stored in the zero compartment, pack it, unseasoned, into waxed containers or wrap it in cellophane and heat seal. Thaw and season it just before using. Unseasoned sausage will maintain its fresh taste for five or six months, but seasoned sausage will turn flat and rancid after 60 days.

A good meat loaf consists of 2 pounds of salt pork ground with 20 pounds of venison.

Mince Meat

2 pounds venison (neck)	2 teaspoons nutmeg
1 pound beef suet	1 tablespoon allspice
6 pounds apples	1 tablespoon cinnamon
2 pounds currants	¼ teaspoon ginger
1 pound sultana raisins	1 teaspoon cloves
2 pounds raisins	1 tablespoon salt
½ pound citron	2 oranges
6 cups brown sugar	8 cups cider or grape juice

Bake the venison 40 minutes in a moderate oven (350° F.). Cool and chop. Mix it with the chopped suet; pared, cored and chopped apples; currants, raisins, and citron. Add the sugar, spices, juice of two oranges, finely chopped rind of one orange, and the cider or grape juice. Simmer 30 minutes and pack hot into jars. Seal and process 60 minutes for pints and 70 minutes for quarts at 15 pounds pressure or 3 hours in a boiling water bath. This formula makes sufficient mince meat for 10 to 12 nine inch pies.

recharged with fresh water to which salt is added (one sixth of a pound for each pound of hide) and run for one hour. Another one sixth of a pound of salt per pound of hide and one pound of chlorinated lime or similar bacteria and mold deterrent is added and the drums rotated for another two hours. At the end of this drumming period, the hides are removed and placed on wooden horses and allowed to drain for several days. They are then graded and bundled for shipment, and if they are palletized, loading is easier, quicker, and less costly.

Brining is an example of the progress made in the preservation and handling of a valuable by-product that has long been neglected and (under old methods) was never a business that had any social standing. Now the clean, defatted, brine-cured hide has a pleasant antiseptic odor and can be merchandised with pride. The costs of curing have been increased, but so has the price offered for the superior product. Costs show that there is no profit in tanning heads and shanks; that curing time is cut from thirty days to hours, releasing considerable storage space; that there is a saving of salt; and that there is a considerable saving in freight charges by removing the non-usable hide components; all of which result in a more reliable product that is easier to handle and store, and one that permits of more accurate inspection.

The fact that only thirty five per cent of the shoes now manufactured use leather for soles, and that it is possible that the same thing may happen as far as shoe uppers are concerned, is of considerable concern to the leather industry.

Commercial Tanning

To produce the desired qualities in the various leathers requires many different manipulations which necessarily make tanning a rather complicated process. The several steps in tanning a hide for leather are, briefly, as follows:

Trimming.—Ears, shanks, and tails are removed. The trimmings from calfskins are sold to be manufactured into gelatin.

Splitting.—Beef hides are split into two sides.

Soaking.—Dried skins are soaked in fresh water (changed every 24 hours) from 2 to 5 days at a temperature of 52° F.

Washing.—The soaked hides must be washed thoroughly to remove dung, dirt, and blood.

Fleshing.—Adhering fat, flesh, and membranes are removed

HIDE CHARACTERISTICS AND CURING PRACTICES

Hides consist mainly of the protein keratin (hair and epidermis) and collagen (body of the hide). Acids destroy collagen and alkalies destroy keratin (the reverse is also true, but not to the same degree). Hides and wooled pelts are therefore dehaired or dewooled by the use of the alkali, lime.

Approximately 62% of a green hide is water. This 62 pounds of water can dissolve a maximum of 23 pounds of salt. One pound of salt is used per pound of hide, some of which is recovered to be reused (the salt is washed before reusing). This refers to the use of crushed rock salt (ice cream salt) which is the common packinghouse practice. In farm practice, ¼ pound of fine sack salt for each pound of hide is sufficient.

Salt Pack Curing

In salt pack curing, hides are spread hair side down in the hide cellar or hide room and one pound of rock salt per pound of hide is sprinkled evenly over the flesh side. Another hide is spread over the salted hide and given a similar application of salt. This progresses until the day's kill is salted. The hides are allowed to cure for approximately thirty days, after which they are freed of any undissolved salt. They are sorted as to weight; graded on the basis of cuts, scores, grub holes, and slips; and folded and tied individually. The undissolved salt is washed and reused on a fresh pack with some fresh salt. During the curing process, one hundred pounds of green hide can lose up to thirty five pounds of water and gain up to six pounds of salt.

Brining Hides

Realizing that excess water, fat, manure, and head and shank parts of hides do not make leather, packers have adopted or are adopting the brine curing method. The necessary equipment depends on whether hides are to be fleshed and demanured before brining them in vats containing a saturated salt brine, or whether they are to be washed and brined but not fleshed (defatted). Fleshing and demanuring machines are available.

A process that cuts labor costs and is not as expensive is drum brining. In this process, the hides (with head removed, shank removed at the knee, and switch end of tail removed) are placed in large revolving drums and washed in clean water (at 55°-65° F.) for ten minutes and then drained. The drums are

by a fleshing machine designed for the purpose. The person doing home tanning should use a sharp, flexible bladed knife.

Dehairing.—Hides immersed in a milk lime solution, made by dissolving 8 pounds of hydrated lime in 4 gallons of water, can be dehaired in 3 to 4 days. The addition of sodium or calcium hydrosulfide materially hastens the loosening of hair and wool and is used in commercial tanneries. Sheep pelts are dewooled by making a lime paste and covering the skin side with a layer ¼ of an inch thick. The pelt so treated is folded along the line of the backbone (limed sides together) and placed in a warm room until the wool slips.

Scudding.—The dehaired skins are placed, grain side up, over a rounded wooden beam, and with a specially designed two-handled knife, the beamster (the man who uses the knife) pushes the knife over the skin, forcing out any material remaining in the hair follicles.

Deliming.—The hide is soaked in a sulfuric acid bath (½ pound of sulfuric acid and 9 gallons of water for 50 to 60 pounds of hide) and left to soak for one hour, changing the position frequently. The object is to remove the lime.

Bating.—This is the process of digesting the degradation products and the elastin fibers in the skin. Prior to 1910, practically all bating was accomplished by the use of manures. When hen or pigeon manure was used, the process was called "bating," but the use of dog manure was called "puering." The active principle in these dung bates was found to be protein-digesting enzymes which caused the skin to become soft and pliable. The enzymes of the pancreatic gland and those produced from wood have displaced the objectionable dung bates. Dessicated pancreas mixed with a dry deliming agent (ammonia salt) can be purchased under the trade name of Oropon (Rohm and Hass Company, Philadelphia, Pa.). Hides and skins are bated in revolving drums at a temperature of about 90° F. for 1 to 1½ hours, after which they are washed in clear water.

Pickling.—If the bated skins are to be preserved for storage and future tanning, they are placed in a pickle bath (7 pounds of salt, 5 gallons of water, and ¼ pound of concentrated sulfuric acid) for several hours.

Tanning.—The common tanning processes may be grouped into vegetable, chrome, and miscellaneous.

1. Vegetable Tanning—Tannin is a chemical substance found in certain classes of plant life and is capable of combining

with animal protein, converting it into leather. The tannin is extracted by leaching the wood or bark in water. Commercial tan-bark is the shredded, spent bark from which tanneries have leached the tannin. In order of rank, the species of plants that furnish the major quantity of tannin for the leather industry are quebracho, American chestnut, mangrove, myrobalans, wattle bark, valonia, spruce, oak, hemlock, gambier, and sumac.

Hides are immersed in tan liquors of a given strength, being moved daily through a series of rocker vats and then a similar number of layer vats, requiring from 30 to 45 days to tan. Harness leather receives the shorter tan, sole leather the longer tanning period. Especially thick hides may be split into several layers to hasten tannin penetration.

2. Chrome Tanning—Sodium dichromate ($Na_2Cr_2O_7$), a red crystalline compound, is the tanning material used in chrome tanning. When converted into chromic sulfate, it combines with hide protein to produce a leather with a greater resistance to heat and abrasion than vegetable tanned leather. Chrome tanning is rapid, requiring only a few days. Unlike vegetable tanning, which imparts various shades of tan to the leather, chrome tanning imparts shades from green to blue. Chrome tanning is sometimes combined with aluminum salts to produce a white leather that has some of the desirable characteristics of chrome leather. Vegetable tanned leathers are often chrome retanned to secure a leather that combines the good qualities of both leathers.

3. Miscellaneous Tannages—A number of "syntans" (synthetic tannins) are on the market. They produce a white leather that lacks the durable qualities of the vegetable and chrome tanned leathers, but which may be combined with the latter processes to produce serviceable leather suitable for special uses. Some common syntans are Leukonal, Tanigan, Tanak, Tanasol, Mertanol, and Arkotan. Other methods of tanning that serve special needs are Calgon, alum, aldehyde, oil, quione, and tungsten tanning.

a. Setting out—This is the mechanical extraction of excess water from the hides as they come from the tanning vats. The same thing is accomplished by hand by means of a "hand slicker" (metal scraper).

b. Splitting—Thick hides that are not to be used for sole leather, but made into upholstery leather, are split by a machine into two or three layers. The wool sides of pickled sheep skins

by a fleshing machine designed for the purpose. The person doing home tanning should use a sharp, flexible bladed knife.

Dehairing.—Hides immersed in a milk lime solution, made by dissolving 8 pounds of hydrated lime in 4 gallons of water, can be dehaired in 3 to 4 days. The addition of sodium or calcium hydrosulfide materially hastens the loosening of hair and wool and is used in commercial tanneries. Sheep pelts are dewooled by making a lime paste and covering the skin side with a layer ¼ of an inch thick. The pelt so treated is folded along the line of the backbone (limed sides together) and placed in a warm room until the wool slips.

Scudding.—The dehaired skins are placed, grain side up, over a rounded wooden beam, and with a specially designed two-handled knife, the beamster (the man who uses the knife) pushes the knife over the skin, forcing out any material remaining in the hair follicles.

Deliming.—The hide is soaked in a sulfuric acid bath (½ pound of sulfuric acid and 9 gallons of water for 50 to 60 pounds of hide) and left to soak for one hour, changing the position frequently. The object is to remove the lime.

Bating.—This is the process of digesting the degradation products and the elastin fibers in the skin. Prior to 1910, practically all bating was accomplished by the use of manures. When hen or pigeon manure was used, the process was called "bating," but the use of dog manure was called "puering." The active principle in these dung bates was found to be protein-digesting enzymes which caused the skin to become soft and pliable. The enzymes of the pancreatic gland and those produced from wood have displaced the objectionable dung bates. Dessicated pancreas mixed with a dry deliming agent (ammonia salt) can be purchased under the trade name of Oropon (Rohm and Hass Company, Philadelphia, Pa.). Hides and skins are bated in revolving drums at a temperature of about 90° F. for 1 to 1½ hours, after which they are washed in clear water.

Pickling.—If the bated skins are to be preserved for storage and future tanning, they are placed in a pickle bath (7 pounds of salt, 5 gallons of water, and ¼ pound of concentrated sulfuric acid) for several hours.

Tanning.—The common tanning processes may be grouped into vegetable, chrome, and miscellaneous.

1. Vegetable Tanning—Tannin is a chemical substance found in certain classes of plant life and is capable of combining

several times to keep it from becoming hard. When dry, the skin is buffed, using a coarse grade sandpaper fastened over a block of wood. The wool is carded, using an ordinary wool card, and the pelt is ready for use. It makes a comfortable cover for the hard, cold seats on farm implements.

Alum Tanning.—This method is suitable for fur skins since the aluminum sulfate does not color the hair or skin. Dissolve 1 pound of aluminum sulfate in 1 gallon of water; dissolve 4 ounces of crystallized sodium carbonate (soda ash) and ½ pound of salt in ½ gallon of water, and pour this slowly into the alum solution while stirring vigorously. The prepared skin (soaked, fleshed, and washed) is placed in the solution for 2 to 4 days, depending upon its thickness, and is then rinsed and put through a wringer. The damp skin is now rubbed with glycerin and as it dries, it is staked and finally buffed. Before it is rubbed with oil or glycerin, retanning the skin with 1 pound of Leukanol (a syntan made by Rohm and Haas Company, Philadelphia, Pa.), dissolved in 1 gallon of water, makes the skin tougher and softer without discoloring it.

Vegetable Alum Tanning.—Dissolve ½ pound of aluminum sulfate and ½ pound of salt in a small quantity of water. Dissolve 2 ounces of gambier or Terra Japonica in a little boiling water. Mix the two solutions and add sufficient water to make 1 gallon. Use sufficient flour with the 1 gallon of tanning liquor to make a moderately thin paste. Take a properly prepared pelt (soaked, trimmed, fleshed, and washed) and apply three coatings about ¼ inch thick at two-day intervals to the skin side of the pelt, removing each previous coating before applying the next. When practically dry, rinse the pelt in warm water containing some borax and then rinse in fresh water. Squeeze out the water and slick the skin with a dull knife. Apply a coating of glycerin and hang up to dry. Stake the pelt several times while drying and then buff with coarse sandpaper.

This method produces a yellow skin of good tensile strength.

are split into grain layers or skivers which are used for making hat bands, bookbinding, etc. The flesh layers are used for making chamois leather.

c. Shaving—Light skins need not be split and are run through shaving machines to even the thickness and make them smooth and clean.

d. Fatliquoring—In order to prevent the cohesion of the leather fibers during the drying process, it is necessary to rub or stuff the damp leather with a fat or oil. This keeps the leather from drying out hard and stiff. Neats-foot oil and glycerin are recommended for home tanning.

e. Staking—Flexing the tanned hide or skin over a rounded metal blade set in the end of a block of wood (3 feet high) fastened to the floor is known as "hand staking." This is an important operation because it stretches and flexes the leather fibers and makes them pliable.

f. Other operations consist of dyeing, drying, buffing (sandpapering to produce a nap), glazing, plating, and finishing. Patent leather, also called japanned or enameled leather, is a chrome tanned leather that has received three separate coatings of a linseed oil varnish. Chamois skin is the flesh side of an oil tanned sheep skin. Cod, whale, seal, or shark oil is used.

Home Tanning

Several simple methods of tanning skins have been devised which make it possible for a novice to make a serviceable product.

Salt Alum Tanning.—The salted sheep skin is soaked in water until soft and then placed on a table or beam where it is trimmed and fleshed. Washing can be done either in a tub or on the table. Any good soap powder will do. The water should be warm (125° F.). Rub and rinse repeatedly until clean and then extract the water by hand or by using an ordinary washing machine wringer. The pelt is placed on the table fleece side down, and given a thorough rubbing with a mixture of 1 part of powdered alum to 2 parts of common salt (4 ounces of alum and 8 ounces of salt will tan the average sized sheep pelt). The pelt is left in this position overnight but the next morning is hung over a rail, skin side up. The following morning the skin is sponged to remove the unabsorbed salt, and one to two ounces of Neats-foot oil or glycerine is rubbed into the damp, soft skin. As the skin dries, during the next two days, it must be staked

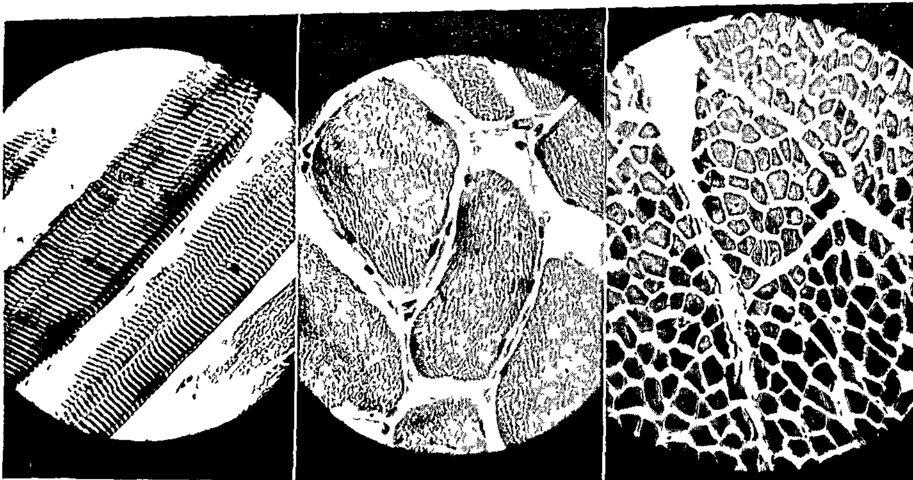


Fig. 13.1—(A) A cross section of the "bottom round" muscle showing four bundles of muscle cells separated by the connective tissue, perimysium. (B) A section of (A) showing several muscle cells surrounded by the connective tissue, sarcolemma. The black dots on the very edge of the muscle cells are the cell nuclei. (C) A high magnification of a longitudinal section of the "top round" muscle, showing the striations of the cells which is characteristic of a skeletal muscle.

PART TWO

XIII. MEAT AS A FOOD

The word meat, when used as a general food term, has a rather broad implication. In this text its meaning is limited to the edible and inedible parts of the carcass of mammals and their organs and glands.

STRUCTURE OF MEAT

The edible meat of carcasses is composed primarily of striated or voluntary muscles which are for the most part connected directly or indirectly with the skeleton and referred to as skeletal muscles. A special variety of striated muscle that is involuntary in action is the cardiac muscle of the heart. A type common to the organs of the intestinal tract are the involuntary, non-striated, or smooth muscles, commonly referred to as the visceral muscles. Fat, nerves, veins, arteries, ligaments, and tendons are an integral part of a combination of muscles and must be considered as meat.

The edible organs and glands are designated as glandular meats or variety meats to contrast them with the muscle meats of the voluntary muscles. They consist of the heart, tongue, liver, pancreas (sweetbread), thymus (veal sweetbread), kidney, spleen, brain, and the walls of the stomach (tripe).

Muscles are made up of cylindrical, multinucleate muscle fibers of varying length, composed of sarcoplasm and enclosed in a sheath of sarcolemma. Bundles of these muscle fibers or fasciculi are enclosed in a tissue called perimysium and the entire muscle is in turn covered by a sheath of more or less compact connective tissue called the epimysium. It becomes increasingly evident from this brief histological description that the smaller and more numerous the muscles, the greater the amount of connective tissue. Since connective tissues are far less tender than the cell contents, it follows that their presence in large quantities characterizes the less tender cuts.

Physical Composition of the Beef Carcass.*

Cuts	Grade			
	Choice	Good	Commercial	Utility
Carcass				
Fat	31	25	20	15
Lean	53	57	60	64
Bone	16	18	20	21
Standing rib				
Fat	31	24	18	12
Lean	50	54	57	61
Bone	19	22	25	27
Butchers round				
Fat	17	14	11	8
Lean	65	67	69	70
Bone	18	19	20	22
Short loin				
Fat	38	30	27	21
Lean	50	55	56	62
Bone	12	15	17	17
Loin end				
Fat	35	28	24	19
Lean	53	58	61	65
Bone	12	14	15	16
Chuck				
Fat	21	16	13	9
Lean	62	65	67	70
Bone	17	19	20	21
Rump				
Fat	28	24	20	15
Lean	51	53	54	59
Bone	21	23	26	26
Brisket				
Fat	45	37	31	25
Lean	41	45	47	52
Bone	14	18	22	23
Short Plate				
Fat	40	32	26	17
Lean	46	52	53	60
Bone	14	16	21	23
Foreshank				
Fat	10	9	6	4
Lean	48	48	48	49
Bone	42	43	46	47
Flank				
Fat	67	61	57	45
Lean	32	38	42	54
Bone	1	1	1	1
Kidney knob				
Fat	86	82	79	76
Kidney	14	18	21	24

*Courtesy U S D A

Proteins

Lean muscle consists of approximately 20% protein, 70% water, 9% fat, and 1% ash. These proportions change as the animal is fattened, resulting in a lessening in the percentage of protein and water and a proportionate increase in fat.

The major protein in muscle is actomyosin, a globulin that consists of two proteins, actin and myosin, combined in a ratio of 1 to 3. It is the structural component that gives muscle the power of movement. Muscle is also made up of *collagen* (connective tissue) that is the basis of structure and the most widely distributed protein in the animal body. A lesser but much tougher component of muscle is *elastin*, occurring in ligaments. Muscle also contains pigments that give color to meat, such as the more prominent *myoglobin*; *nucleoproteins* which control heritable characteristics of the cell; and the many *enzymes* that perform a catalytic function for almost every reaction in the living cell. In addition, there are many other functional proteins.

Another group of proteins that are really end-products of protein metabolism are the water soluble proteins or *nitrogeneous extractives*. They have little nutritive value in themselves but are physical and chemical stimulants in that they excite the flow of gastric juice. Along with fat, they provide a great deal of the aroma and flavor of meat. Because of this stimulating effect, broths are served as the first course to prepare the stomach for the heavier food to follow. Examples of this group of proteins are creatine, creatinine, and the purines. More of these proteins are present in older animals and they are particularly abundant in the much exercised or less tender cuts. They impart to game animals that so-called "gamey flavor."

Proteins are changed by the digestive juices into amino acids in which form they are readily absorbed into the blood stream. To date there are 23 recognized amino acids, ten of which are considered essential to life. In the following list, the letter (E) designates those considered essential: Glycine, alanine, serine, valine (E), leucine (E), isoleucine (E), norleucine, threonine (E), aspartic acid, glutamic acid, hydroxy glutamic acid, arginine (E), lysine (E), cystine, methionine (E), phenylalanine (E), tyrosine, iodgorgoic acid, thyroxine, histidine (E), proline, hydroxy proline, and tryptophane (E).

It is noteworthy that all of the essential amino acids have been found prevalent in the heart, liver, kidney, and muscle tissue.

Fats

Considerable energy in the average diet is supplied by animal fats which are highly digestible. Aside from its high caloric value, fat plays a most important role in adding palatability to the lean in meat because of the flavor and aroma contained in its oils. The firm, white, saturated fats are associated with quality meats. Unsaturated fats are soft and oily, and lower the grade of the meat.

The chemical difference between the two fats just mentioned lies in the number of double bonds existing between the carbon atoms. When the carbon valence is satisfied with hydrogen, the fat is saturated, whereas if it lacks this hydrogen, it is an unsaturated fat. Since iodine will unite with the carbon on the free hydrogen link, its addition to fat will denote the degree of unsaturation which is designated as the iodine number. Another method used to determine softness or unsaturation is to run polarized light through a prepared piece of fat and read its refractive ability, designated as its refractive index.

Fats may be hardened by a process in which the missing hydrogen is forced to combine with the carbon by the use of a catalyst (sodium methoxide) which breaks the double carbon bond. This is known as the hydrogenation process and is now in general use for the hardening of vegetable oils and lard.

The melting points of fat vary with the class of the domestic animal and the kind of feed it received.

The following shows the range of melting points from the different classes of animals:

Pork	
Back fat	86°-104° F.
Leaf fat	110°-118° F.
Beef	
External fat	89°-110° F.
Kidney fat	104°-122° F.
Lamb	
External	90°-115° F.
Kidney	110°-124° F.

Carbohydrates

The liver is the carbohydrate reservoir of the animal body, containing about one-half of all the carbohydrates found in the body. The remaining half is distributed through the muscles

The ability of the human body to resist disease is dependent upon its ability to produce antibodies—substances which attack specific foreign bodies. Using new analytical methods, scientists discovered that the antibody molecule is actually a molecule of globulin (a class of proteins). Since the blood globulin, as well as the albumins, are built up from the amino acids in food, it suggests to the scientist that the same conditions must apply for the proper synthesis of antibody globulin. Work completed at this writing has given proof that sufficient amino acids supplied in the diet to maintain the protein reserves of the body is an important factor in acquiring immunity to a disease.

The protein content of meat varies from around 15% in pork to 20% in beef, veal and lamb.

Chemical Composition of Meats Percentage (Fresh Weight).*

Name	Protein	Carbohydrate	Fat	Ash	Ca.	Phos.	Milligrams per Kg.	
							Iron	Copper
Bacon (lean)	12.2	1.4	53 0	4.7	.006	.108	24.0	5.0
Beef chuck (good)	17.6	0.0	22 0	.8	.012	.220	30.0	1.0
Beef heart (lean)	16 9	.7	3.7	1 1	.018	.268	35 3	...
Beef kidney	15 0	.9	8.1	1.1	003	.182	41.0	1.1
Beef liver	19.7	6.0	3.2	1 4	.008	.420	79.0	21.5
Beef loin (good)	15.6	0 0	31.0	8	.012	.216	30.0	1.0
Beef round (good)	18.7	1.4	17.0	.9	.012	.216	30 0	1.0
Beef tongue	15.7	.4	18.0	.8	.008	.200	60.0	...
Ring bologna	14.4	0.0	17.8	3 0	.003	.068	28.4	...
Chicken	21.1	0 0	4.5	1.1	.012	.232	32.0	3.5
Duck	21.4	0.0	8.2	1.2	.010	.200	23.0	5 0
Eggs	12.8	7	11 5	1.0	.067	.180	30.0	2.3
Goose	22.3	0.0	7.1	1 1	009	.175	24 0	3.3
Haddock	17.2	0.0	3	1.2	.018	.197	5.0	2.8
Halibut	18 6	0.0	5 2	1.0	.020	.200	10.0	2.3
Ham (fat)	14 6	3	44 0	5 1	.012	.215	30.0	...
Lamb chops	21.7	7	29 9	1.3	021	.180	33 0	4.2
Lobster	16 2	.5	1.9	2.2	.018	.188	9.0	7.0
Margarine	.6	.4	81.0	2.5	.004	.012	3.0	.4
Mutton (leg)	19.8	0.0	12.4	1.2	.010	.270	30 0	4.0
Oysters	9.8	5 9	2.0	2 0	.052	.155	45.0	30.8
Pork chop (good)	14.8	0.0	32 0	.8	.010	.180	25.0	3.1
Pork sausage	10.8	0.0	44.8	2 1	.007	.116	16.3	1.2
Rabbit	20.8	0.0	10.2	1.1	.019	.183	5.6	2 0
Salmon	17.4	0 0	16.5	1.0	.025	.250	12.0	2.0
Scallops	14 8	3 4	.1	1.4	.115	.338	30 0	2.3
Shrimp	25 4	.2	1 0	2.6	.096	.292	27.0	4.3
Turkey	24 0	0 0	6.7	1 1	.030	.420	45 0	1.8
Veal chop (good)	18 6	0 0	15.0	1.0	.012	.220	30 0	2.5
Veal cutlet (good)	19 1	0.0	12.0	1.0	.015	.228	30.0	2.5
Milk	3.5	4.9	3.9	.7	.120	.093	2.4	.2

*Courtesy, H. J. Heinz Company

Meat Production and Consumption from Total United States Slaughter, 1912-19[illegible]

Year	Beef			Veal			Lamb and Mutton			Pork (excluding lard)			Per Capita Consumption		
	Production	Consumption Total	Consumption Per Capita	Production	Consumption Total	Consumption Per Capita	Production	Consumption Total	Consumption Per Capita	Production	Consumption Total	Consumption Per Capita	All Meats	Lard	Civ. Pop. Mil
	Million Pounds	Million Pounds	Pounds	Million Pounds	Million Pounds	Pounds	Million Pounds	Million Pounds	Pounds	Million Pounds	Million Pounds	Pounds	Pounds	Pounds	Pounds
1912	6,234	6,153	64.7	666	662	7.0	735	701	7.7	6,822	6,357	69.2	145.9	11.6	95.3
1913	6,182	6,157	63.8	662	608	6.3	706	708	7.3	6,979	6,501	66.8	143.7	11.0	97.2
1914	6,017	6,143	62.7	608	572	5.8	693	612	7.2	6,824	6,454	67.4	140.9	11.0	99.1
1915	6,075	5,609	57.1	569	591	6.0	605	595	6.2	7,616	6,690	65.9	134.9	11.9	100.5
1916	6,460	6,001	59.6	590	656	6.5	585	463	5.9	8,207	7,037	67.3	140.1	12.0	102.0
1917	7,239	6,687	65.4	655	745	7.3	463	499	4.5	7,055	6,094	69.8	135.3	10.6	103.0
1918	7,726	7,167	69.2	744	761	7.4	506	598	4.8	8,349	6,385	59.6	135.3	12.3	103.4
1919	6,759	6,462	61.5	760	924	7.8	590	579	5.7	8,477	6,711	61.6	141.6	11.0	105.1
1920	6,300	6,294	59.1	819	852	8.0	538	661	5.4	7,648	6,765	63.9	138.9	12.2	106.5
1921	6,022	6,025	55.7	842	825	7.6	639	584	6.1	7,697	7,039	63.5	136.0	11.1	108.5
1922	6,588	6,002	59.2	820	858	7.8	553	593	5.1	8,145	7,238	65.0	137.7	13.7	110.1
1923	6,721	6,671	59.8	852	910	8.2	588	596	5.3	9,483	8,309	65.9	117.3	11.7	112.0
1924	6,877	6,785	59.9	916	977	8.6	597	605	5.3	9,149	8,451	74.5	147.3	14.6	114.1
1925[1]	6,878	6,888	60.0	972	993	8.6	603	637	5.3	8,128	7,734	74.7	140.1	12.5	115.8
1926	7,059	7,074	60.7	989	958	8.2	639	631	5.5	7,966	7,528	67.3	138.0	12.5	117.4
1927	6,395	6,185	54.0	955	875	7.4	629	661	5.3	8,430	8,059	61.6	134.9	12.9	119.0
1928	5,771	5,872	49.0	867	782	6.5	663	695	5.5	9,011	8,514	68.2	131.6	13.6	120.5
1929	5,871	6,048	49.8	773	767	6.3	682	824	5.6	8,833	8,483	71.3	131.2	13.1	121.8
1930	5,917	6,021	48.9	761	794	6.4	825	886	6.7	8,482	8,215	69.8	129.0	12.9	123.1
1931	6,009	6,026	48.5	792	823	6.6	885	893	7.1	8,739	8,477	67.0	130.7	13.8	121.0
1932	5,759	5,820	46.7	823	822	6.6	884	849	7.1	8,923	8,826	69.3	131.1	14.5	124.8
1933	6,440	6,469	51.4	822	891	7.1	852	949	6.8	9,134	8,796	70.6	136.1	14.1	125.6
1934	7,066	7,066	55.8	891	1,065	8.4	800	796	6.3	8,397	8,130	69.9	143.9	13.0	126.4
1935	6,644	6,827	53.5	1,065	1,023	8.0	885	884	6.9	5,969	6,204	64.2	17.1	9.6	127.2
1936	7,467	7,351	58.8	1,023	1,098	8.6	867	858	6.7	7,552	7,138	48.6	130.6	11.3	128.1
1937	6,831	7,113	55.3	1,098	1,096	8.5	863	869	6.7	6,066	7,220	55.6	126.2	10.6	128.8
1938	6,912	7,002	54.5	1,036	985	7.6	897	839	6.9	7,721	7,594	55.9	127.1	11.1	129.8
1939	7,001	7,119	54.5	985	961	7.3	870	872	6.7	8,627	8,441	58.3	133.6	12.8	130.9
1940	7,182	7,239	55.2	961	961	7.3	878	875	6.6	9,958	9,577	64.4	142.4	14.6	132.1
1941	8,101	8,182	61.5	961	1,029	7.7	925	919	6.9	9,451	9,169	72.5	143.7	14.3	131.8
1942	8,675	8,867	61.2	1,029	1,106	8.2	1,026	976	7.2	10,642	8,792	65.3	140.3	13.4	131.5
1943	8,523	6,434	49.6	1,107	1,028	7.9	1,104	824	6.4	13,340	9,647	72.4	146.8	11.1	128.9
1944	9,137	6,905	53.4	1,160	1,466	11.2	1,023	865	6.6	12,893	10,302	76.7	154.2	14.2	128.6
1945	10,270	7,617	58.7	1,595	1,507	11.6	1,050	939	7.2	10,040	8,546	65.9	145.2	12.6	129.1
1946	9,378	8,108	60.3	1,590	1,376	9.9	970	928	6.7	11,173	10,522	75.7	154.2	12.0	138.4
1947	10,429	9,660	69.2	1,440	1,540	10.7	802	700	5.3	10,605	9,660	70.0	155.3	13.4	142.6
1948	9,174	9,157	62.6	1,600	1,392	9.4	752	729	5.0	10,193	9,991	68.3	145.5	13.6	145.2
1949	9,448	9,421	63.1	1,422	1,299	8.7	607	611	4.1	10,333	10,042	67.6	144.6	12.8	147.8
1950	9,519	9,522	63.0	1,322	1,192	7.9	599	598	4.0	10,751	10,398	68.8	144.6	14.0	150.2
1951	8,843	8,523	56.1	1,061	1,007	6.6	522	517	3.4	11,483	10,865	70.6	138.0	13.9	151.1
1952	9,607	9,518	61.2	1,173	1,103	7.1	648	640	4.1	11,547	11,132	71.6	146.0	13.6	153.4
1953	12,414	12,151	70.8	1,559	1,498	9.5	729	735	4.6	10,063	9,937	62.9	155.3	12.9	156.0
1954	12,091	12,772	79.2	1,664	1,608	10.0	735	731	4.5	10,010	9,684	60.0	154.7	11.2	159.1
1955	13,569	13,306	80.9	1,578	1,531	9.3	758	753	4.6	10,834	10,831	66.8	162.8	12.3	162.3
1956	14,462	14,121	85.4	1,632	1,573	9.5	741	735	4.4	11,221	11,147	67.5	166.8	12.8	165.2
1957	14,211	14,251	[illegible]	1,528	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

and in the blood stream. It is stored in the liver in the form of glycogen and distributed to the muscles by the blood stream. The exact changes that take place in energy metabolism by the conversion of glycogen to glucose to lactic acid have not been completely determined. It is definitely known that glycogen changes to lactic acid and that the process is reversible in the live animal but not in the dressed meat. Because of this, the lactic acid content of a carcass increases during aging or ripening (letting meat hang for two to six weeks to become more tender).

Water and Minerals

Fat is low in moisture, therefore, the higher the finish, the lower the total water content of a carcass or cut. Mature fat beef may contain as little as 45% moisture, while veal may run as high as 72%. An important point to remember is that the leaner the meat demanded by the consumer, the more water he buys at meat prices.

Muscle itself is a poor source of calcium since the calcium content of the body is centered in the bone. However, muscle meats, and more particularly glandular meats, are exceptionally rich in iron and phosphorus. Iron is an essential ingredient in the formation of red corpuscles, a lack of which causes anemia, while phosphorus is an essential constituent of body cell tissue and is necessary for the assimilation of calcium from other sources. Liver is an excellent source of easily assimilated iron and is prescribed in the diets of anemia sufferers. Muscle contains less than half as much iron as liver.

It has been found that the animal body also requires copper, fluorine, manganese, zinc, cobalt, magnesium, and iodine for normal functioning. Only a trace of manganese has been found in muscle, with liver showing considerably more. A trace of magnesium is found in muscle and liver. Muscle contains a small amount of aluminum; liver a slightly higher content.

The presence of zinc in the pancreas led to further research which showed that it is a necessary mineral in the diet. Liver was found to be about four times as rich in this element as muscle. Copper, which is thought to increase iron utilization, is found in small quantities in muscle and in slightly larger quantities in liver. Sodium and potassium chloride salts abound in meat.

Color Pigment

Myoglobin is the color pigment in muscle; *hemoglobin* is the pigment in blood. Very little hemoglobin occurs in the muscle

This latter condition occurs mainly on the first quarter inch of cut surface. Beef that has been aged for four to eight weeks will show a very dark, even a moldy or slimy cut surface, but a thin slice will remove this discoloration and the newly cut surface will be bright and fresh.

Beef placed in an edible oil previously saturated with CO_2 retains its fresh appearance for 3 to 4 weeks.

Fig. 13 3—A Prime and a Utility round. An excellent comparison of conformation (a plump versus a flat round), and of quality (marbling, bright red color, and firmness versus no marbling, dark color, and softness).

The iridescent sheen sometimes seen on meat is caused by the breaking up of white light by the highly fibrous character of the meat surface and the film of fat on these fibers.

The blood remaining in animal carcasses varies—6% to 20% in muscle; 2% to 8½% in bone, and 1% to 2% in kidney.

THE CONSUMER AND THE RETAILER

The consumer thinks of meat as that edible portion of a cut or joint which can be carved with ease and masticated with gastronomic satisfaction. Bone and fat are frowned upon as being something the retailer is constantly trying to pawn off on him for the purpose of making extra profit. The processor and the retailer think of meat in its broader sense as including all the structures of the carcass, such as lean, bone, fat, tissues, ligaments, blood vessels, arteries, and nerves. Obviously, this difference in definition causes much misunderstanding between the retailer and the consumer. The consumer must realize that closer trimming and less bone decreases salable poundage. The retailer buys on the basis of grade and weight, and the more trimming the meat receives, the higher will be the cost of the finished cut. The consumer must also learn that the price of meat to the

of carcasses that were well bled, therefore the amount of myoglobin present will determine the color of the meat. Older animals have a higher myoglobin content, which causes their meat to be darker. There are instances of dark cutting or isolated dark muscles in young beef caused by a depletion of muscle sugar or glycogen. Light colored beef has a pH in the range of 5.3-5.9, whereas the pH of dark colored meat ranges from 6 to 6.6. It is the glycogen that is converted to lactic acid that lowers the pH of the muscle.

Beef is always darker when first cut, but upon exposure to the air for thirty minutes the hemoglobin and myoglobin become oxidized, changing to oxyhemoglobin and oxymyoglobin, which are a brighter shade of red. After a period of time, depending upon favorable or unfavorable temperature and moisture conditions, the meat will again turn dark. In other words, dark beef (1) may occur in certain animals or muscles regardless of age; (2) is a characteristic of the flesh of older animals; and (3) is also the color of meat after it has been cut for some time.

Fig. 13.2—Quality in pork. The marbling evident in the above pork cuts is becoming a rarity due to the lean pork demanded by the consumer. The above cut illustrates the chop that can be cut from the shoulder to the ham. Beginning at the shoulder (4) blade shoulder steak, (5) loin blade chop, (2) rib chop, (1) loin chop, (3) hip loin chop.

tissue after slaughter drops to this point as a result of lactic acid formation, rigor begins and is essentially complete in normal tissues by the time the pH reaches 6.3."[1] There is a slight rise in temperature in the first stages of rigor mortis ascribed to the glycogen lactic acid reaction which changes the pH of the muscle.

The amount of connective tissue (collagen and elastin) is greatest in those areas where there are the greatest number of small muscles, such as the neck, heel of round, and shank. Since the eye muscle of the rib, the strip muscle of the loin, and the inside muscle of the round (top round) receive a minimum of exercise and are in themselves large muscles containing but little tissue, they are the recognized tender cuts of beef. The most tender muscle in the entire carcass is the tenderloin (tender or fillet) which is located in the loin directly under the region of the lumbar vertebrae. This muscle receives practically no exercise and is tender in animals of all ages regardless of finish but less desirable from the older animals.

Beef and lamb should be aged from two to six weeks but only the better grades can be aged economically for the longer periods. The reason for this lies in the fact that carcasses must have a fat covering to protect the meat from bacterial action by sealing it from the air. The mold that develops on the outside of the fat is readily trimmed off without any loss other than would normally occur in the regular trimming. In the Commercial and Utility grades, this fat covering is lacking, and the bacteria find an excellent medium for development in the moist muscle tissue, with the result that the trimming loss is considerably greater because it is not a regular trimming loss.

An aging cabinet (6′ x 6′ x 9′) with four shelves and the cooling unit on top, producing gravity cold air (temperature 36°-40° F.) and a 90° humidity, has given successful results. Quarters or wholesale cuts are placed on the shelves and are aged for one week. It is claimed that shrinkage is held below 3% as compared to 12%-15% in ordinary three week aging.

OTHER TENDERIZING METHODS

Acetic Acid

The acetic acid in vinegar and lemon juice can serve in the same capacity as the sarcolactic acid formed in the muscle cells.

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[1]D. M. Doty, American Meat Institute Foundation, University of Chicago.

retailer and the trimming waste increase progressively with the higher grades.

The chart giving the physical composition of the beef carcass illustrates the difference in the lean, fat, and bone content of four grades of beef carcasses. The major portion of the fat is external and internal fat covering—the fat the customer wishes to have trimmed off. Since only about 53% of a choice carcass is lean, it can readily be seen why boneless cuts must be rather high in price.

The retailer in turn should employ fair practices and sell only the grade he advertises, prepared in the manner demanded by the customer. "He should recognize that a customer is the most important person to enter his business career, in person, by mail, or by phone; that a customer is not an outsider to his business—he is a part of it. Customers are not dependent on him—he is dependent on them. A customer is not a cold statistic —he is a human being with feeling and emotions like his own, with biases and prejudices. A customer is not an interruption of his work—he is the purpose of it. The retailer is not doing a favor by serving him—rather the customer is doing the retailer a favor by giving him the opportunity to do so. A customer is not someone with whom to argue or match wits—nobody ever won an argument with a customer. And finally, a customer is a person with wants that should be filled with profit to both."—*The Pennsylvania Meat Dealer.*

AGING MEAT

Fresh meat is usually rather tough. The resistance of warm, freshly killed meat to the shear test (using the Warner-Bratzler shear machine) is less than the same muscle tissue after 24 hours of chill. After the 24-35 hour chill, the meat becomes progressively more tender.

The action of proteolytic enzymes on the connective tissue in meat, reducing them to a gelatinous consistency, is the tenderizing action that transpires during the ripening process (holding or aging for 2-4 weeks).

"Rigor mortis results indirectly from the increased acidity due to lactic acid formation. The essential step in the phenomenon is the removal of phosphate from adenosine triphosphate (an enzymatically-catalyzed reaction). The enzyme responsible is inactive at acidities less than pH 6.5 but when the pH of the

enzyme (papain) into the animal's jugular vein minutes before slaughter. The size of the injection is dependent upon the weight and grade of the animal. The tenderizing enzyme is carried to all parts of the body through the blood stream and the claim is made that its tenderizing effect is equal to about two weeks of aging. The process was developed in the Swift and Co. laboratories and meat so treated is sold as Proten meats. It is also applicable to veal, lamb, mutton, and fowl.

High Temperature Aging

Enzymes are not very active at the lower temperatures but their activity increases as the temperature rises. This fact was established at the Mellon Institute in 1936. The problem has been to hold down bacterial spoilage at the higher ambient temperatures. The first method used to destroy the aerobic or surface bacteria was by the use of the Sterilamp (Tenderay Process). This process was adopted and was widely used for twenty or more years. It had, however, several weaknesses. The major weakness was its inability to penetrate the meat, leaving the internal areas, such as the deep seated hip joint, unprotected to the ravages of anaerobic bacteria. This made it necessary to thoroughly chill the carcass before aging it at the higher ambient temperatures. Another objection to the process was the effect of the rays upon the human eye, necessitating the wearing of goggles or eye glasses for those working under the lights. The Sterilamp is lethal to bacteria, but only to those coming into contact with its rays.

The more recent methods used to hold down bacterial spoilage stress internal rather than external spoilage, unless coupled with irradiation. The substances used are "antibiotics," a class of chemicals which have exhibited food preservative qualities.

The first patented process to gain national prominence was labeled "Acronize." It entailed the needled injection of wholesale cuts or carcasses with a solution of chlortetracycline. In the case of live animals, an intraperitoneal injection is given from one to four hours before slaughter, after which the warm carcasses are permitted to hang at room temperature for 48 hours. Dressed poultry is Acronized by dipping it into the solution made up for the purpose. Acronize is a patented trade name for the process.

A more recent method developed by the scientists of the American Meat Institute uses the antibiotic, oxytetracycline,

themselves. The juice of a lemon mixed with several tablespoonfuls of olive oil and a slight seasoning of salt is called a "marinade," and acts as a tenderizer when applied to both surfaces of a steak two or three days previous to the time it is to be broiled. Because of the effect of the acid on metal, the treated steak must be placed in an earthenware dish. The object of the olive oil is to seal the surfaces from the air and thus cause the meat to keep fresh and bright in color for a longer period of time.

Venison and bear meat are much improved if placed in a diluted solution of vinegar (an equal amount of water and vinegar) for several days before cooking. Acetic acid also acts as a preservative.

Vegetable Enzymes

Three enzymes of vegetable origin which dissolve or degradate collagen and elastin are (1) *papain*, secured from the tropical American tree "Carica papaya," (2) *bromelin*, secured from the juice of the pineapple, and (3) *ficin*, secured from figs (Latin: Ficus-fig tree). Elastin, unlike collagen, is not degraded by aging or cooking but is dissolved by these enzymes. They have made very effective tenderizers and have had good consumer acceptance. The most readily available commercial preparations contain papain.

Their use on steaks and small cuts is more effective than on large roasts due to the inability of the enzyme to penetrate the meat. This makes it necessary to fork the tenderizer into the meat. On roasts, it is necessary to make several punctures with a butcher's steel or a sharp knife, and then use the steel or knife to shove some tenderizer into the puncture. This is in addition to a surface application. Apply to steak ½ hour previous to cooking and to roasts about 2 hours before roasting.

A more recent tenderizer appearing in commercial form is known as a Controlled Meat Tenderizer and consists of hydrolized vegetable proteins, vegetable proteolytic enzymes (papain, bromelin, and ficin), salt, monosodium glutamate, dextrose, propylene, glycol, and other spices, in a solution of purified water. The claim is made that one of the enzymes works on muscle fiber, another on elastin fiber, and another on connective tissue. It has been approved for use in government inspected plants.

A patented process of tenderizing meat, approved by the Meat Inspection Division of the U. S. D. A., consists of the injection of a clarified, concentrated, standardized proteolytic

became possible to make beef unevenly tender in a 52° F cooler in 6 days, uniformly tender in a 55° cooler in 5 days, in a 60° cooler in 2 to 3 days, in a 65° cooler in 2 days, and in an 85° cooler in 4 to 5 hours. The best results were secured when meat was held in a temperature of 60° F with an 85° to 90° humidity for 3 days. The shrinkage loss did not average over one-half of one per cent in a six-day period, and the trimming loss due to mold and slime was reduced to a minimum.

The investigators claimed that this method of tenderization raised beef several grades in eating quality. This statement raises the question of whether increasing the tenderness of a carcass without increasing any other palatable qualities changes the grade.

THE SECRET OF ULTRA VIOLET LIGHT

Visible light is made up of different wavelengths which produce the various colors of the rainbow, each color being produced by a group of wavelengths. The waves producing red are about 8000 angstroms in length, while those producing violet are only half as long, 4000 angstroms. An angstrom is a very minute unit of measure, so small that 250 million angstroms equal only one inch. Wavelengths of radiation adjacent to and longer than the visible red radiations are invisible heat waves or infrared and those shorter than 400 angstroms to about 1850 angstroms are invisible ultraviolet. Different groups of ultraviolet waves provide different effects, but do not give us any sensation of light or heat. The wavelengths nearest the visible region, 4000 to 3300 angstroms, are used in producing photographic or other photochemical effects. The adjacent group, 3300 to 2900 angstroms, are anti-rachitic, produce tanning of the skin, and are the shortest waves of sunlight not filtered out by the air.

The third region of ultraviolet comprises the wavelengths from about 2900 to 2000 angstroms, and are germicidal in effect. The most effective germicidal wavelength is about 2600 angstroms, but the nearest value which can be obtained practically is 2537 angstroms from the discharge of electricity through mercury vapor at pressures of about one to two per cent of atmospheric pressure. More than 95% of the ultraviolet radiation from STERILAMPS is in this germicidal region. The shortest wavelengths of ultraviolet which have been classified are in the region of 2000 to 1850 angstroms, and their effect is to break up oxygen in the air to form ozone. The germicidal radiation is

which is also needle injected into the live animal. However, the warm carcasses are held in an ambient temperature of 110° for 24 hours. The claim is made that the tenderness of the meat so treated is equivalent to meat which has been aged for approximately two weeks.

The tetracycline antibiotics mentioned above are effective against internal spoilage of carcasses, particularly at the joints, preventing or reducing bone sour until the carcasses are thoroughly chilled. Antibiotic ice (a tetracycline is added to the water before it is made into ice) has proven very effective in preserving fish in the fresh state on fishing boats for a period of ten to fourteen days and its use has U. S. D. A. approval.

The "Tenderay" Process

On March 21, 1939, the Mellon Institute of Pittsburgh, Pennsylvania, presented the results of three years of research on the tenderizing of beef. The work was done by Drs. M. D. Coulter and G. D. Beal under a fellowship sponsored by the Kroger Food Foundation and the Westinghouse Electric Company.

Scientists knew that microorganisms could not live long in ultra-violet light, but it was Dr. Harvey C. Rentschler, director of Westinghouse research laboratory, and his associates, who devised the necessary meter to determine just what ultra-violet wave lengths are the most deadly. The most important element in this meter is a photoelectric cell which responds only to radiations of the right wave length.

Scientists also knew that meat fibers are bound together by transparent compounds, known to chemistry as collagen, but more commonly called connective tissue. They discovered that in hung (ripened) beef these compounds were transformed into gelatin which has no mechanical strength. Drs. Coulter and Beal reported that the transformation from collagen to gelatin was caused by living catalysts known as enzymes. At low temperatures the enzymes are not very active, but their activity increases with the higher temperatures. Since the higher temperatures are also conducive to the development of bacteria and mold, the use of the sterilamp made it possible to hold the meat at high temperatures without bacterial decomposition.

It was also known that high humidity lowers shrinkage and keeps meat from getting dark in color. By utilizing these known factors, they arrived at a working basis that yielded the following results: With the lamp and an 85° to 90° humidity, it

moisture weight loss from evaporation and maintains a brighter color on the meat surfaces because of this. But it also gives a moist surface which encourages bacterial development. Here is where the use of the ultraviolet light fits into the scheme. The rays destroy the germs and mold in the air and on the surface of the meat, making it safe to use high humidities and higher cooler temperatures. Higher cooler temperatures lower the running time of the refrigerator compressor, resulting in a saving of power. The high humidity saves considerable poundage of meat that would otherwise be lost by evaporation.

SELECTING MEAT FOR QUALITY

The word quality infers superiority. To determine the degree of superiority requires a knowledge of the visible elements in a piece of meat that give it quality. Since the consumer has very little if any opportunity to see any of the physical characters that indicate the age of the animal from which the meat was obtained, he or she must make a choice by looking for the following conditions.

Color of Lean, Fat, and Bone

Color of the lean is important for the purpose of identification. For example, beef ranges in color from a bright cherry red to dark red; veal is a pinkish brown; pork is gray-pink to gray-red; lamb is light pink; and mutton is bright red in color.

Color of the lean is important in suggesting the age of the animal because as an animal grows older, the meat turns a darker shade. For example—young beef is light red, beef from old animals is dark red; lamb is bright pink, mutton is brick red; young pork is gray-pink, older hogs gray-red; veal a pinkish brown, and calf (older veal) is a reddish brown.

Color of the lean is important in that it may indicate how long a cut of meat has been held. The exposure of a cut surface to air, whether it is cold or warm air, will cause that surface area to lose moisture (dehydrate) and turn dark in a period of two or three days.

Color of the lean is *not* particularly important as an index of quality, since numerous cooking tests have shown that an otherwise prime or choice grade of meat from carcasses of similar age and finish eat as well regardless of whether the meat is a bright cherry red or a dark shade of red.

absorbed by the ozone, which is thus reconverted to oxygen and in this way the ozone is limited to very low concentrations.

Germicidal ultraviolet wavelengths in the region of 2600 angstrom units have the unique quality of being fatal to microscopic organisms coming within their range. Experiments have shown that weak radiation continued over a relatively long period of time, several hours, are more effective than more intense radiation for a few seconds. It is thought that during the life cycle of an organism there are periods when it is more easily killed than at other times. For example, the organism may be weaker just after or just before subdivision than during its middle life. This fact has practical importance since it means that the total quantity of ultraviolet radiation is less with relatively low intensity, such as would be obtained from wall or ceiling fixtures of the indirect type.

Invisible germicidal radiation can be generated in simple and inexpensive lamps consisting essentially of slender tubes of special glass exhausted of air and refilled with inert gases and a small amount of mercury. An electrical discharge between electrodes at opposite ends of the tube vaporizes the mercury and causes it to glow with a pale blue light and to radiate the greater part of the energy in the germicidal ultraviolet region which is most effective in killing microorganisms. The glow discharge may be started by heating the electrodes and applying moderate voltage or by applying high voltage to the unheated electrodes. The ultraviolet output is equal for equal power input to each type of lamp. The two types may be designated as hot cathode and cold cathode. The ultraviolet lamps used in irradiating homes, offices, or schoolrooms are of the hot cathode type.

Ultraviolet Light for Meat Coolers

The preservation of fresh meats is accomplished by the use of refrigeration temperatures of 33° to 40° F. These temperatures inhibit the development of bacteria and molds in proportion to the moisture present and the storage temperature. By using low temperatures and a low humidity, the surface of the meat becomes dry and spoilage is retarded considerably. This is what happened before the industry changed over from low temperature cooling coils which accumulated frost and maintained a low humidity, to the modern high temperature coils which defrost automatically and maintain a higher humidity in the cooler.

This higher humidity does several things. It cuts down

color (becoming whiter), and increases in hardness The buttons are hard and bony at 4 years of age The visible portion of the pelvic bone located in the rump will show a smooth surface with a white cartilagenous lining where the separation was made with a knife In older animals (4 years and up), the pelvic bone will lack this cartilage separation and will show a hard bone that was sawed The bones in the sacrum (the back bone area of the loin end) will become very hard and fuse into one bone in advanced age The sign posts for age now read Young (red porous bone, button on the feather bones, smooth, glossy pelvic bone) Old (white, dense, flinty bone, no buttons, sawed pelvis, ossified sacrum)

Firmness

A soft, soggy, watery meat is not a quality meat It may have a fine texture and be rather tender if it is from young beef, but this does not elevate it from the category of a "gravy" cut A soft, greasy, or oily fat is a low quality fat It should be dry, hard, and flaky

Texture

The grain or texture of meat is seldom given any thought by the consumer It will vary more with the age of the animal than it will between animals of the same species A fine texture gives meat a smooth, velvety appearance whereas a coarse texture appears globular, the difference being caused by the thicker cell walls in the latter Since cell walls, made up of collagen, are the least tender part of a cell, it follows that any abnormal amount would affect the textural structure and appearance of the meat and make it less tender

Marbling

Marbling is considered to be the most important factor in giving quality to meat Its discussion was left until last because it has a bearing on all the other factors already mentioned Marbling is the intermingling of fat among the muscle fibers appearing either (1) as a fine webbing resembling a spider web (fine marbling), (2) as flashes of fat that are heavier and resemble streaks of lightning, referred to as coarse marbling, and (3) as flecks of fat giving meat a combination mottled and webbed appearance Any one of these types is welcome in meat,

Color of the fat *is not* a true index of quality, but a white or cream white fat is characteristic of young, grain-fattened cattle. A yellow fat is prevalent in animals with more maturity, since they have, in their more extended life span, been able to store up more carotene from the large amounts of roughage and cottonseed meal they may have consumed in that time. Several of our prominent breeds of dairy cattle that are noted for the high fat content and rich color of their milk have a very yellow fat, and transmit this characteristic to their offspring in a proportionate degree when crossed with other breeds that have a light colored fat. This does not mean that the carcass from a young animal that carries a yellow fat is lacking in quality of fat if that fat is firm and dry. In fact a yellow fat will furnish more vitamin A to the consumer's diet, it will have just as rich a flavor, and be as acceptable as a white fat.

But—one must remember that if the yellow fat is there because of the age of the animal, the meat will be tough and stringy; if the fat is there because it is inherited from these dairy breeds, then the cut of meat will probably lack muscling and marbling because these cattle were developed for their milk producing ability and lack the muscling and meat producing qualities of our beef breeds or their crosses. This is not presented as an argument against the eating quality of young dairy animals, for that would be wasting words on a dairyman.

Color of the bone is important to the purchaser of carcass meat and the meat grader because the color and texture of the bone indicate the age of the animal. The spinal column or backbone and the aitch or pelvic bone offer the most visible sign posts for determining age. Since the consumer wants as little bone as possible, it follows that these sign posts of age have been taken down as far as he is concerned. The backbone consists of interlocking vertebrae which vary in shape according to their location. Those in the region of the fore quarter or thoracic region have rather long, thin, flat processes that extend upward and are known as the superior spinus processes, more commonly referred to as feather or fin bones. In young animals these feather bones have not hardened into bone at the tip but are still cartilagenous or white and are called buttons. The color of the ossified portion of the bone in a young animal is red and the physical appearance is porous.

As the animal increases in age, the buttons ossify or harden into bone and the bone itself becomes more dense, loses its red

Knowing these things does not guarantee the eating, because there is the cook who can even ruin the gravy.

LEARN THE GRADES OF MEAT

The U. S. Department of Agriculture has, as one of its many obligations, the duty of carrying out the provisions of two separate acts of congress that affect our meat supply.

The first of these is the Meat Inspection Act of 1906 which provides inspection, by graduate veterinarians, of all animals before and after slaughter. It guarantees the consumer that all meat bearing the circular inspection stamp is free from disease; that it was processed under sanitary conditions; that no harmful ingredients have been used in the meat products; and that all labels and names are truthful statements of facts.

In 1925, Congress passed an act that set up a meat grading service, an agency that certifies class, quality (grade), and the condition of meat and meat products examined to conform with uniform standards. Federal grade standards were set up and grade names given to identify meats that conformed to the standards. The grade mark is a purple ribbonlike stamp that appears on practically all retail cuts. It is enclosed in a shield and bears the legend U. S. D. A. and the particular grade. It should not be confused with the round Federal inspection stamp.

A consumer must learn, either by study or from experience, what government grade names mean and represent, and the same is true of packer brands that represent these grades. Quality in meat is quite variable and difficult for the average person to recognize in the retail cut. Because of this fact, the consumer has come to depend on items bearing brand names. If the particular brand meets his or her approval, a new customer has been added—until some better graded product is tried and accepted. The manufacturer of a food product may be unknown to the public, but the brand name of his product, if good, is on every tongue. There are so many brand names, however, that it would appear that the terminology used by the U.S. grading service would be a pleasant relief.

Federal Meat Grades (as set forth in U.S.D.A. Leaflet No. 310)

The Federal grade stamp on meat provides consumers with a reliable guide to quality. Each grade name is associated with a specific degree of quality, thus enabling consumers to utilize meat most efficiently by preparing it in the manner for

and cooking tests have shown no preference in their effect on the flavor and juiciness of meat.

Marbling is found most abundant in the flesh of highly finished animals that are approaching or have reached maturity. Its development is slower than is the laying on of internal and external fat. For that reason it is common to find highly finished carcasses of young animals with very little if any marbling. Expect to find a high degree of marbling in highly finished 2 and 3 year old cattle; 10 to 12 month old lambs and particularly 12 to 18 month old yearlings; 8 to 10 month old barrows and gilts; and never look for it in veal because it just isn't there.

Marbling is therefore something that one must consider along with the age of the animal. Some of the most highly marbled meat appearing in a market could be from an aged fat cow of one of the beef breeds or its cross. The way to determine age has already been discussed and to allay the fear that might arise in the mind of the consumer, let it be said that reputable meat retailers do not sell this type of meat as retail cuts because the meat is tough and a customer's account might be lost.

Why Marbling Is So Important

Practically everyone enjoys a rich, delicious meat gravy. At the same time, the desire is also for a highly flavored, juicy, tender piece of meat. To get the gravy one must sacrifice the flavor of the meat. As an example let us compare the pan frying of a prime grade steak (well marbled) as against a low grade steak (no marbling). In the frying process (the same thing happens in broiling or in roasting), the marbling in the prime steak melts and encapsulates the cells, thereby holding in the water-soluble proteins (gravy making ingredients) which are rich in aroma and flavor. The fat itself is high in aroma and flavor, and in addition is a good conductor of heat. It also adds juiciness to the meat because it takes the place of the water that is driven off by the heat. The result is a tender, juicy, highly flavored steak with fat drippings that contain very little of the water-soluble proteins for gravy making. The unmarbled steak has no protection. The water-soluble proteins escape into the skillet, the moisture evaporates, the steak begins to curl, shrivel, and become dry, hard, and tasteless. The best part of this kind of steak is the gravy; thus the term often applied to cuts of low grade meats is "gravy cuts."

high proportion of lean to fat make them the preference of many people.

USDA STNDRD

Standard grade beef has a very thin covering of fat and appeals to consumers whose primary concern is a high proportion of lean. When properly prepared, such beef is usually relatively tender. It is mild in flavor and lacks the juiciness usually found in beef with more marbling.

USDA COMRCL

Beef that is graded Commercial is produced from older cattle and usually lacks the tenderness of the higher grades. Cuts from this grade, if carefully prepared, can be made into satisfactory and economical meat dishes. Most cuts require long slow cooking with moist heat to make them tender and to develop the rich, full, beef flavor characteristic of mature beef.

USDA UTILITY

Beef of this grade is produced mostly from cattle somewhat advanced in age and is usually lacking in natural tenderness and juiciness. The cuts of this grade, as they appear in the retail markets, carry very little fat but provide a palatable, economical source of lean meat for pot roasting, stewing, boiling, or ground-meat dishes. For satisfactory results, long, slow cooking by moist heat is essential.

OTHER GRADES

There are also two other grades of beef—Cutter and Canner. These are ordinarily used in processed meat products and are rarely, if ever, sold as cuts in retail stores.

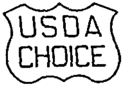
Other Meats Graded

Veal, calf, lamb, and mutton are also federally graded. In addition to the grade name that identifies the quality of the meat, the kind of meat is also indicated as veal, calf, yearling mutton, and mutton. This identification appears with the grade stamp on retail cuts as illustrated below.

which it is best suited. There are eight official grades for carcass beef. Six of these—Prime, Choice, Good, Standard, Commercial, and Utility—may be found in retail stores. Most retailers sell only the grade or grades that are requested or deemed to meet the needs of their customers. The grade name appearing on the grade stamp can be used to serve the consumer in two important ways—(1) as a guide to quality and (2) as a guide to preparation.

Beef of each grade will provide a satisfactory dish if appropriately cooked. The degree of quality which is associated with each of the grades is briefly discussed in the paragraphs that follow.

As the name implies, beef of this grade is highly acceptable and palatable. Prime grade beef is produced from young and well-fed beef-type cattle. The youth of the cattle and the careful intensive feeding which they have had, combine to produce very high quality cuts of beef. Such cuts have liberal quantities of fat interspersed within the lean (marbling). These characteristics contribute greatly to the juiciness, tenderness, and flavor of the meat. Rib roasts and loin steaks of this grade are consistently tender, and cuts from the round and chuck should also be highly satisfactory.



This grade is preferred by most consumers because it is of high quality but usually has less fat than beef of the Prime grade. More of this grade of beef is stamped than of any other grade. Choice beef is usually available the year-round in substantial quantity. Roasts and steaks from the loin and rib are tender and juicy, and other cuts, such as those from the round or chuck which are more suitable for braising and pot roasting, should be tender with a well-developed flavor.

This grade pleases thrifty consumers who seek beef with little fat but with an acceptable degree of quality. Although cuts of this grade lack the juiciness associated with a higher degree of fatness, their relative tenderness and

Remembering that Federal meat grading is done on a voluntary basis, the above table is not based on total kill but merely on the number they were requested to grade.

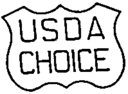
VITAMINS

It was not until the latter part of the 19th century that scientists discovered that dietary factors other than the proteins, carbohydrates, and fats were vital for health maintenance. In 1912, Casimir Funk, a Polish bio-chemist, coined the word "vitamine" to cover this group of dietary essentials because he wished to designate a particular one which he believed at the time to be an amine. Since that time, new factors have been discovered, many of which have been isolated, identified, and chemically synthesized.

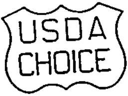
Vitamin A (Anti-xerophthalmia)

Vitamin A is an alcohol of high molecular weight which is soluble in oils and fats but nearly insoluble in water. It is stable to heat, acids, and alkalis but is destroyed by light and by oxidation. It occurs in animal tissues chiefly in the form of fatty acid esters. Alpha, beta, and gamma carotene ($C_{40}H_{56}$) and cryptoxanthin, the yellow coloring matter in many vegetables and fruits, are called precursors or "provitamin A," and the animal body is able to convert them into vitamin A. The beta carotene should yield two molecules of vitamin A, whereas the alpha and gamma should yield but one.

This vitamin received early recognition but was never given a chemical name. It is considered an essential factor in keeping the epithelial tissues and the mucous membranes of the respiratory and genito-urinary tracts and the cornea and conjunctiva of the eye in healthy condition. It promotes growth, aids in the resistance to infection, tones the nervous system, and is essential for successful reproduction. Sheep and calf liver are particularly rich in vitamin A, followed by beef, lamb, hog, and pig liver, kidney, and chicken liver in the order named. Cod liver oil, butter, cheese, eggs, and fish roe are also excellent sources, followed by beef fat, cream, ice cream, and whole milk. Apricots, broccoli, carrots, kale, spinach, pumpkins, yellow squash, sweet potatoes, and turnip greens, along with certain fruits, are excellent sources of carotenoid pigments which can be transformed into vitamin A in the animal body.



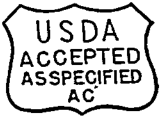
VEAL



CALF

INSTITUTIONAL SERVICE

Since 1923 the Federal Meat Grading Service has assisted organizations, such as government agencies, private institutions, and other purveyors of meals, in their meat procurement programs. This service involves (1) assisting the purchaser in the development of specifications to assure accurate and uniform interpretation, and (2) examining the product to assure its compliance with the specifications. Upon acceptance, each piece or package is stamped, as illustrated below, and the purchaser is furnished with an official certificate containing pertinent information about the product.



Meats Officially Graded

	Prime	Choice	Good	Standard	Commercial	Utility
			BEEF			
	%	%	%	%	%	%
1956	5.7	57.0	26.0	2.2	3.5	4.3
1958	3.5	61.0	28.6	2.9	1.1	1.2
1959	2.8	66.0	26.0	2.5	.8	1.1
			VEAL			
1959	1.1	22.0	64.5	11.2		1.0
			LAMB and MUTTON			
1959	1.2	87.5	10.8			.4

rather sensitive to light. A deficiency of this factor causes stunted growth, premature aging, unwholesomeness of the skin, and a general lowering of the tone of the body. Riboflavin is now known to take part in a number of enzyme systems in the animal body, all of which play important roles in tissue oxidation. It has been found to be a valuable agent in addition to nicotinic acid and thiamine in the treatment of certain cases of pellagra.

Veal and beef liver, followed by beef kidney, lamb liver, pork liver, and pork kidney, are rich sources of vitamin B_2. Beef heart, milk, oysters, eggs, sardines, yeast, whey (dried), crabs, legumes, prunes, and strawberries are also excellent sources. Ham, bacon, chicken, fish, lamb, beef, cereals, and certain fruits and vegetables are good sources. Very little loss of the vitamin occurs in cooking. It is estimated that the meat in the ordinary diet furnishes about 20% of the necessary daily vitamin B_2 requirment. Farmers are reported to obtain 50% of their vitamin B_2 requirement from milk and about 17% from meat, poultry, and fish. Reports show that where 25% of the budget goes for meats, those products furnish about 30% of the vitamin B_2 requirement.

Nicotinic Acid (Niacin)

This is a simple compound, occurring as a white powder or in needle crystal form, soluble in water and alcohol. Its biological importance was discovered in 1937, and it is made synthetically. It is also called the anti-black tongue factor since it is a cure for black tongue in dogs. In the form of nicotinamide, niacin also plays an important part in oxidative enzyme systems in body tissues. A deficiency of nicotinic acid over an extended period will cause pellagra, dermatitis, glossitis, and insanity in humans.

Nicotinic acid is heat stable and is found abundantly in pork, beef, veal, and lamb liver. Pork and beef kidney rank next, followed by pork and beef heart, pork meat, veal, chicken, beef, and lamb. Salmon, wheat germ, whey (dried), and yeast are also excellent sources. Other sources considered good are buttermilk, eggs, haddock, milk, kale, peas, potatoes, tomatoes, and turnip greens.

One-fourth pound of liver or one-half pound of veal, pork, or beef per day is reported to furnish the daily human nicotinic acid requirement.

It is estimated that one-fourth pound of calf liver or one-half pound of beef liver will supply the daily requirement for this vitamin.

Vitamin B_1—Thiamine (Antineuritic)

Vitamin B_1 is a thiazol-pyrimidine compound called thiamine and is soluble in water but insoluble in oils and fats. It exists in pyrophosphate ester form in animal tissue and is an important coenzyme known as cocarbxylase which plays an important role in carbohydrate metabolism. Vitamin B_1 or thiamine was isolated in 1926, was chemically synthesized in 1936, and is sold as the salt, thiamine hydrochloride.

A deficiency of this vitamin is the cause of a nervous disease, known as beri-beri. Symptoms include loss in weight, loss of appetite, slowing of the heart beat, impaired intestinal functioning, impaired reproductivity functioning, and failure of lactation. Thiamine promotes growth, stimulates appetite, aids digestion and assimilation, and is essential for normal functioning of nerve tissue.

Pork is an excellent source of thiamine. Dr. C. A. Elvehjem reports that one pork chop contains 325 international units or the equal of the entire daily requirement for humans. He also reports that from 12% to 50% of this vitamin may be lost during the cooking process, and explains that some of the thiamine is extracted from the meat by the water in which the meat is cooked. In this case, the meat juice or broth contains the dissolved thiamine and should not be discarded. Fried meat shows a smaller loss of the vitamin. Yeast, bran, cereal grains, and legume seeds are rich vegetable sources. Liver, meat, bacon, fish, eggs, milk, and oysters are also considered good sources of thiamine, as are fruits and vegetables.

A half-pound serving of round steak or two hamburg patties will furnish from 160 to 200 I. U.'s of vitamin B_1. Investigators report that the thiamine content of pork from garbage-fed hogs is considerably lower than pork from grain-fed hogs.

Vitamin B_2 (G) Riboflavin

A yellowish-green, fluorescent, water soluble pigment, a compound of flavin and the pentose sugar ribose, riboflavin is another of the growth promoting factors of the B complex. It was isolated in 1933 and chemically synthesized in 1935. Riboflavin is stable to heat, mineral acids, and oxidizing agents, but is

Muscle meats and fish are good sources, with eggs contributing to a lesser extent. Gastric juice in the stomach is an important factor since it releases vitamin B_{12} and improves its absorption. Folic acid may affect the storage of the vitamin. Vitamin B_{12} and folic acid, one or the other, are effective in the prevention and treatment of human macrocytic anemia (enlarged red blood cells), a condition found in pernicious anemia, sprue, and the anemia of pregnancy.

Pantothenic Acid

This B vitamin plays an important role in the metabolism of fats and other fat compounds such as cholesterol. It is available as a synthetic preparation in the form of dextrorotatory calcium pantothenate. Experiments with rats, dogs, and pigs indicate that requirements of this vitamin are from five to ten times those of thiamine or riboflavin. Clinical evidence indicates that humans on poor diets show increased retention of pantothenic acid.

Kidney, liver, and beef heart were found to be potent sources, followed by beef spleen, beef pancreas, beef tongue, with beef, lamb, pork, and veal having one-tenth the potency of liver or kidney. Pantothenic acid is fairly heat stable.

Vitamin C (Antiscorbutic)

This factor is a product of hexose sugar and is also known as ascorbic acid. It is water soluble and has been isolated and chemically synthesized. *A deficiency of vitamin C causes scurvy.* Sprouting plants are rich in this vitamin, as are citrus fruits and vegetables. Meats are only a fair source of vitamin C. The greatest concentration in animal tissue exists in the adrenals, corpus luteum, and the thymus. *Open kettle cooking and wilting destroy* considerable vitamin C.

Vitamin D (Antirachitic)

Vitamin D is formed following irradiation of ergosterol forming calciferol or vitamin D_2. Other forms of this sterol group are now well known, such as vitamins D_3, D_4 and D_5. Vitamin D is formed in human and animal bodies when the skin is exposed to direct sunlight or ultraviolet light. It is *insoluble in water,* soluble in oils and fats, and heat stable. A synthetic form of vitamin D called Delsterol is now available.

The function of vitamin D is to regulate calcium and phosphorus metabolism and it is, therefore, essential to *normal bone*

Vitamin B_6 (Pyridoxine)

Pyridoxine has been called the rat acrodynia factor, having been found to be essential for the maintenance of a healthy skin in rats and for the utilization of unsaturated fatty acids. It was isolated in the crystalline state in 1938 and is available commercially. It is water soluble, stable to heat, acids, and alkali, but is destroyed by light and ultraviolet irradiation. Pyridoxine ($C_8H_{11}NO_3$) has been used successfully with thiamine and nicotinic acid in treating beri-beri.

Pyridoxine deficiency symptoms in the human have been restricted primarily to infants and young children subsisting on certain prepared dietary formulas. It has been established that pyridoxine derivatives function in certain enzyme systems which have to do with the transfer of amino (NH_2) groups in metabolism of nitrogen compounds. Lean meat and kidney are reported to be slightly more potent sources of vitamin B_6 than liver, with heart and brains furnishing lesser amounts. Egg yolk, wheat germ, and yeast are also excellent sources. Fish, milk, legumes, and wheat are good sources. It is estimated that meat furnishes a large share of the daily requirement of this vitamin.

Folic Acid

Names formerly used for folic acid were vitamin M, vitamin Bc, and L. casei factor. It has been found to be essential for the development of red and white blood cells. Pure folic acid crystals are used medicinally for the treatment of pernicious anemia. It was synthesized in 1945, is only moderately heat stable, and is present in green leaves. Pteroyl glutamic acid is the name of the folic acid molecule in the form in which it occurs in liver. At one end of the formula is the double ring of the pterin group, a previously known yellow compound. The central grouping in the formula is the para-amino-benzoic acid ring formerly thought to be protective against graying hair. The third component in the folic molecule is glutamic acid, a normal constituent of most proteins.

Liver, kidney, beef, veal, yeast, green leafy vegetables, and wheat are good sources of folic acid.

Vitamin B_{12} (Anti-pernicious anemia factor)

The animal protein factor (APF) has turned out to be vitamin B_{12}, the only vitamin which contains an inorganic base, namely, cobalt. "Variety meats" contribute the most vitamin B_{12}.

Composition of 100 Grams Raw Liver (U. S. Dept. of Agr.).

Liver	Calories	Protein	Ca	Phos	Iron	Vitamins				
						A	B^1	B^2	Niacin	C
Beef	136	19 7	7	358	6 6	43,900	26	3 33	13 7	31
Pork	134	19 7	10	362	18 0	14,200	40	2 98	16 7	23
Lamb	136	21 0	8	364	12 6	50 500	40	3 28	16 9	33
Veal	141	19 0	6	343	10 6	22,500	21	3 12	16 1	36

FROZEN MEATS (QUALITY AND PORTION CONTROL)

Quality control is a must in any packaged article because the judgment of the article by the buyer has to be made after the purchase is opened in the home. Sight unseen buying means that quality must be guaranteed.

Portion control is very important in a frozen product such as meat, which is a budget item with most consumers. One of the objections to packaged frozen meats is the inability of many customers to get the exact size and weight of steak or roast or the exact number of chops they require. Once they realize that an extra chop or steak can be refrozen and used later, the dilemma should cease.

Frozen portion-control meats have become one of the biggest potential money makers in the lines of institutional distributors. The reasons are: (1) prefabricated cuts require from 10% to 15% less storage space; (2) they eliminate a bothersome labor problem in kitchens; (3) portion control meats lend themselves to exact cost control; (4) they also lend themselves to exact inventory control; (5) they simplify menu planning; (6) they eliminate (a) cooler shrinkage, (b) spoilage, and (c) bothersome trimmings; (7) they eliminate the need of costly equipment; and (8) they save on shipping charges.

The cost of handling frozen meats is 7% to 10% below that of fresh meats. Weight reduction by fabricating meat at point of slaughter can save $120-$160 per car in freight costs between principal meat producing and meat consuming centers.

PREPACKAGED MEATS

The sale of pre-cut, wrapped, unfrozen fresh meats in the more than 25,000 chain stores represent the bulk of retail meat sales in the United States. Cellophane, coated on one side with a moisture-proof coating with oxygen permeability, but with an uncoated wettable side, is the most popular wrap since it permits

growth and tooth development. It prevents rickets in infants and children and softening of the bones in adults. Rich sources of vitamin D are cod liver oil, fish, egg yolk, irradiated foods, and milk. Pork and beef liver are considered good sources, calf liver and other meat products containing only fair amounts.

Vitamin E (Antisterility)

This vitamin is made synthetically and is available commercially as alpha-tocopherol. It is insoluble in water but is soluble in oils and fats and is heat stable. A deficiency of this factor is the cause of resorption of the young in the female during gestation and the loss of fertilizing power in the male. The *tocopherols* are good antioxidants and retard development of rancidity in fats.

Cottonseed oil, corn oil, peanut oil, wheat germ oil, and green lettuce are rich sources of this vitamin, nearly all green leafy vegetables, whole grains, meat, milk, and eggs being considered good sources.

Vitamin K (Antihemorrhagic)

Vitamin K was discovered in 1935 and is made synthetically. Only two forms designated as vitamins K_1 and K_2 have been isolated from natural sources. It is fat soluble and heat and light stable. It is essential for the production of prothrombin, a blood coagulant, and aids in the prevention of hemorrhage in newborn infants and in cases of obstructive jaundice. A form of vitamin K that can be injected into the blood stream in surgical operations has been developed.

The K vitamins were first isolated from alfalfa leaf meal and from putrefying fish, the principal commercial sources. Hog liver is also a rich source. Cabbage, carrot greens, spinach, soybean oil, tomatoes, hempseed, cauliflower, rice bran, kale, and egg yolk are considered good sources. The principal commercial source is a synthetic product known as menadione.

Choline

This is the sixth crystalline member of the B complex and is essential for normal fat metabolism, prevents slipped tendons in turkeys, and is one of the substances to which perosis responds. Liver, pancreas, and meat are considered rich sources of choline.

XIV.

CUTTING PORK AND RENDERING LARD

Properly chilled pork is a prerequisite for successful pork cutting and processing. The procedure followed on many farms of cutting the carcass the same day the hog is slaughtered is not according to safe and sound pork processing practice. At least a 24-hour chill at temperatures ranging from 33° to 38° F. is necessary to properly remove the animal heat and give the carcass sufficient firmness to make possible a neat job of cutting.

The method of cutting pork is practically the same in all sections of the United States. Slight differences occur where hog carcasses are split on either side of the backbone (farmer style) instead of through the center of the backbone (packer style).

CLASSES AND GRADES OF PORK CARCASSES

Barrows and Gilts		U. S. No. 1 U. S. No. 2 U. S. No. 3 Medium Cull
Sows	Sow (Packing) pork carcasses, 200 to 320 pounds	U. S. No. 1 U. S. No. 2 U. S. No. 3 Medium Cull

the meat to maintain its bloom for a day or two. The mea placed on a back board and the cellophane is placed over the n and then heat-sealed to the back of the board.

One teaspoonful of ascorbic acid in two quarts of cold w makes a dip that will preserve the bloom of freshly cut me at a low cost. Meat so treated must bear a label stating t vitamin C or ascorbic acid has been added. Packaged meat n be under constant refrigeration and away from bright light

The first frozen meats sold through mail order channels instituted by Montgomery Ward in May of 1960. The meats v prepared, frozen, and packaged by Armour & Co., and ship in insulated packages, packed with dry ice. They are ship express prepaid to any part of the United States.

Unlike beef, veal, and lamb, pork does not leave the packing plant in carcass form but is fabricated in the plant. Only about 15% to 20% of the cuts are sold fresh, the remaining 80% to 85% being cured by various methods, rendered into lard, or manufactured into meat products.

The weight of a carcass and the degree of fat it carries determines its adaptability to a particular use. The trade desires fairly lean bacons, averaging 8 to 10 pounds, and to produce these requires 150 to 200 pound carcasses with deep sides and a moderate finish.

Pork cuts are priced on a weight basis. Carcasses from the general run of butcher type hogs will yield the following weight of trimmed cuts:

Yield of Cuts in Pounds.

Carcass Weight	*Ham*	*Loin*	*Picnic*	*Bacon*
140 to 160 pounds	12–14	8–10	5– 7	8–10
160 to 180 "	14–16	10–12	7– 9	10–12
180 to 200 "	16–18	12–14	9–11	12–14
200 to 220 "	18–20	14–16	11–13	14–16
220 to 260 "	20–25	16–20	13–16	16–20

THE CUTS OF PORK

A hog carcass is divided into five main cuts: (1) head, (2) shoulder, (3) loin, (4) belly, and (5) ham. In the case of a packer's style carcass, the head may or may not be split but in either case it is removed by leaving the jowl attached to each side of the carcass.

Jowl

When removing either the head or the jowl separately, start close to the shoulder on the lower side, slightly back of the crease in the jowl, and cut to a point just behind the ear. This cut will be in line with the ribs and across the atlas joint, which is the only vertebra in the neck where the head can be easily disjointed. A common mistake is to leave too much jowl on the shoulder. Fresh trimmed jowls are known as "bean pork." The farm practice is to clean the head thoroughly after it is removed. The eyes, teeth, and ears are cut out and the remainder of the head is cooked for head cheese or scrapple.

Packers square the jowls and cure and smoke them in the

Stags	Processing or manufacture, 200 to 400 pounds	No. 1 No. 2 No. 3 Cull

Boars	Manufacture (inedible) all weights—ungraded

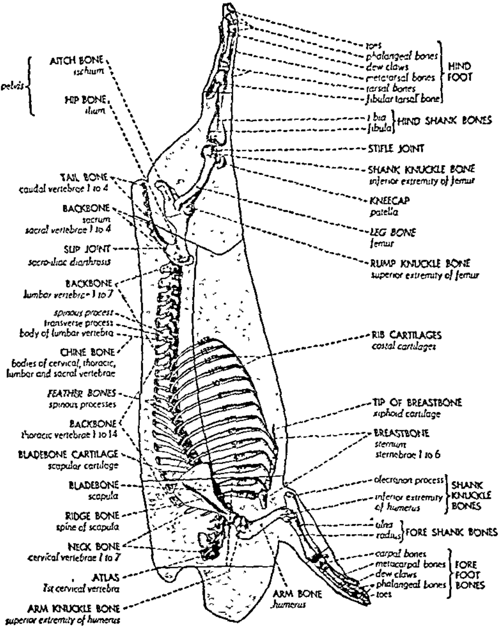


Fig. 14.1—

15% to 20% of the cuts are sold fresh, the remaining 80% 85% being cured by various methods, rendered into lard, manufactured into meat products.

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Packers square the jowls and cure and smoke them in th

same manner as bacon, marketing them as "jowl bacon." The bulk of the jowls are used in making fresh or cooked sausages and loaf meats. The jowl represents from 3% to 4% of the carcass weight.

Shoulder

The size of the shoulder is optional with the cutter. For farm purposes, a three-rib shoulder (large) is the most common.

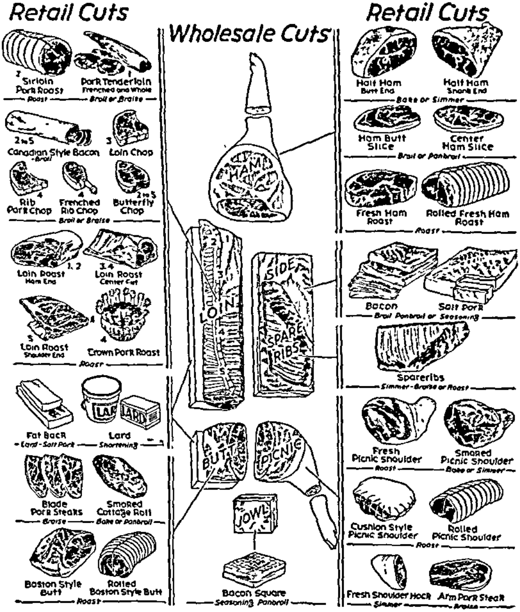


Fig. 14.2—

Fig 14 3—Removing a three-rib shoulder The cut is made parallel with the rib The jowl is removed in line with the blade side to make a square cut shoulder The three rib neckbone is removed and the breast piece trimmed off Remove the fat from two thirds of the outside area of the shoulder as in a "skinned" ham.

Fig 14 4—Left—Fresh Cala or Picnic. Center—Boston style butt. Right —clear plate

A California Picnic shoulder and a Boston style butt are made from the New York style shoulder (trimmed, skinned shoulder minus neck bone and hock). The terms "Cala" and "Picnic" are most commonly applied to the cured and smoked lower half of the shoulder. A "skinned shoulder" is made by removing the rib and neck bone and the breast flap on the inside of the shoulder and cutting off the foot at the knee or one inch above. The skin and

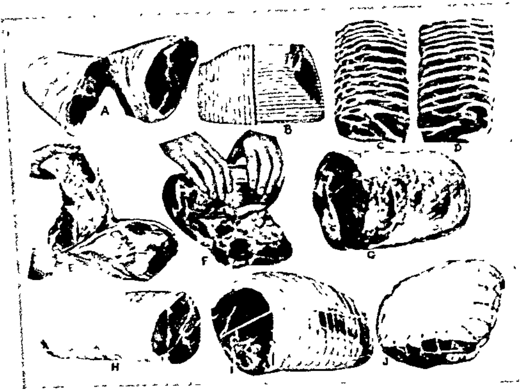


Fig. 14.5—Retail cuts of a pork shoulder. (A) Pork hock; (B) shoulder with hock off, scored to show how (C) blade steak and (D) arm steak are cut. (E) Dividing the shoulder into (F) inside and (H) outside shoulder roll by following the natural seam to the blade bone and then cutting through to the back. (G) The completed inside shoulder roll; (I) a rolled Boston style butt, and (J) a cushion style Picnic shoulder.

fat are taken off the outside of the shoulder to within 4 inches of the base of the shank, neatly beveled on the edges, leaving not more than ½ inch of fat on any part. The division between the Boston butt and the Cala or Picnic is made by cutting directly below the exposed blade bone across the shoulder where the neck bone was removed. Boston butts should not have a fat covering more than ¼ inch thick. A "rough shoulder" is an untrimmed shoulder with the foot and jowl removed but neck

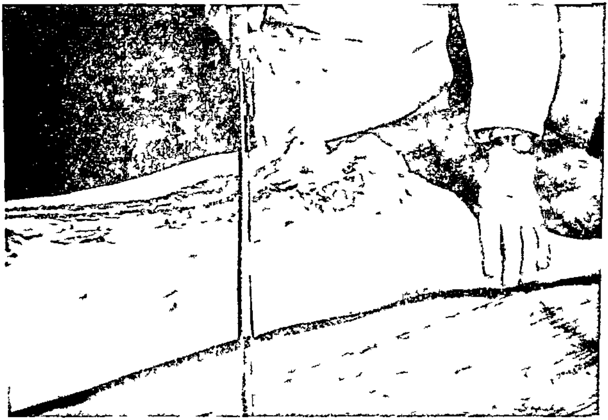


Fig 14 6—Removing the ham To make this cut, place the saw directly back of the curve in the backbone at the same angle the knife would be when cutting across the hock Saw between the 2nd and 3rd sacral joint

Fig 14 7—Making a skinned ham A collar of skin is left covering about ⅓ the area of the ham on the hock end

Fig. 14.8—Trimming off the flank.

Fig. 14.9—Lifting the tail bone. Start at the tail and remove the sacrum by cutting toward the sacroiliac joint.

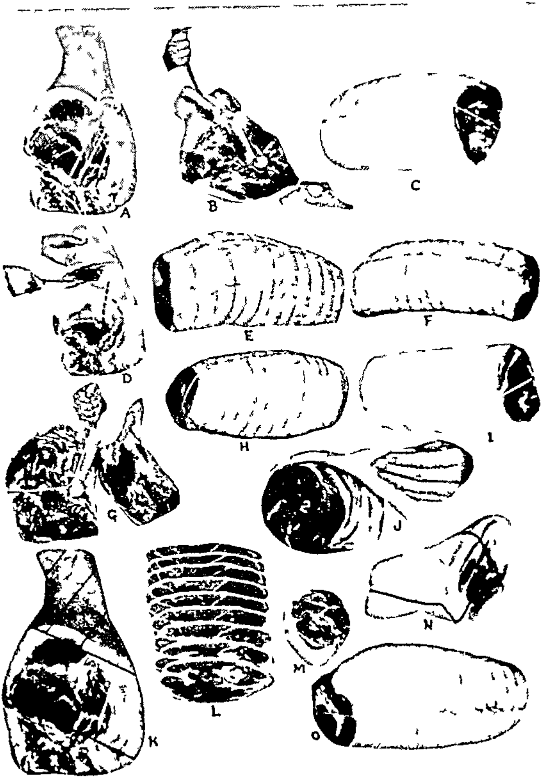


Fig 14 10—Retail cuts from a fresh ham. (A) A fresh ham showing the position of the bone (dotted lines) (B) removing the aitchbone femur and tibia (C) the completed rolled fresh skinned ham, (D) unjointing the hock at the stifle joint and then by removing the aitchbone the ham may be divided into two roasts (E) the knuckle and (F) the cushion (G) dividing a large ham into three boneless roasts the knuckle roast (H) which is the part being removed in (G), the inside roast which is the top half of the cushion numbered 2 and illustrated by (J) and the outside ham roast numbered 3 and completed in (I) (K) a ham marked off to show how the ham butt is removed, leaving the center cut for roasts or slicing and the ham hock which can be cut into three pieces; (L) center cut ham slices (M) center cut ham for baking (N) another method of dividing a ham hock for seasoning pieces (O) the completed fresh ham butt roast made by boning two fresh ham butts and tying them together with the fat side out.

bone left in. A "regular shoulder" has the neck bone and ribs, breast flap and foot removed but all the fat left on. "Cala ham" is an incorrect term for a "Cala" and is barred by law in some states because the term "ham" misrepresents the cut. About 23% of a hog carcass is untrimmed shoulder or 14% to 16% trimmed.

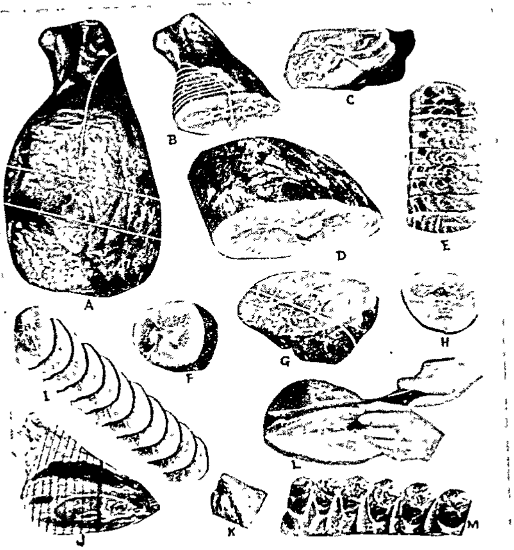


Fig. 14.11—Cuts from a smoked skinned ham. (A) Four cuts from a heavy smoked ham (butt, center, knuckle and heel); (B) hock; (D) center cut and (G) ham butt illustrate the three divisions into which most of the smaller hams are cut: (C) hock with the heel removed; (E) heel slices; (F) center cut; (H) double ham butt slices made by lifting off the aitch bone as illustrated by the line in (G) and then cutting through on every second slice as in (L); (I) center slices; (J) another method of obtaining ham shank slices; (K) the knuckle piece for seasoning; (M) ham shank slices.

Ham

Hams may be cut long, medium, or short, depending upon the size of the carcass or the amount of loin desired. The flank and tail bone are removed and the foot cut off through or above the hock. Short shanked hams are preferred by the trade. Unskinned ham is known as a "regular ham" and sells for several cents less per pound than a "skinned" ham. The ham represents from 22% to 28% of the weight of a carcass or about 17% to 19% when trimmed (skinned).

Loin

The separation of the loin from the belly does not show much variation in cutting practices. If the ribs are cut long, some of the bacon is sacrificed, and since bacon is a valuable commodity, pork loins are cut fairly close to the eye muscle. "Regular" pork loins have the excess fat removed over the tenderloin and not more than ½ inch of fat back left covering the outside of the loin. "Bladeless" pork loins are regular loins minus the blade bone. "Short cut" pork loins are regular pork loins from which the shoulder end has been removed behind the blade bone and the ham end removed next to the hip bone. Almost half the rough weight of a pork loin from a choice carcass is in the fat back which is dry salted for salt pork or rendered into lard. Approximately 20% of a hog carcass is in the untrimmed loin, 13% to 16% in the trimmed loin.

Belly

The rough belly represents about 17% of the weight of the carcass. When the spareribs (2½%) are removed and the ends and sides trimmed, the marketable bacon or belly is only around 14% of the carcass weight. If very little trimming is done and the teats are left on, the bacon will average several per cent higher. Buttons (nipples), however, do not accompany a high class bacon. Special care should be taken to avoid making any deep gashes in the bacon when removing the spare rib. The knife should be kept close to the ribs (cut them spare). Spare ribs cut "meaty" are so cut at the sacrifice of bacon.

Fat

The fat trimmings may be rinded (skinned) and cut into small pieces for rendering. All fat trimmings, including the fat

Fig. 14.12—Separating the loin and belly. Make the cut about an inch from the tenderloin muscle on the hip and to about one inch from the end of the backbone on the blade end of the loin. Saw through the ribs.

back, represent from 15% to 30% of the carcass weight, depending upon the degree of finish.

Lean Trimmings

The lean trimmings will vary with the closeness of the trim on the primal cuts, but on a conservative basis they average from 4% to 5% of the carcass.

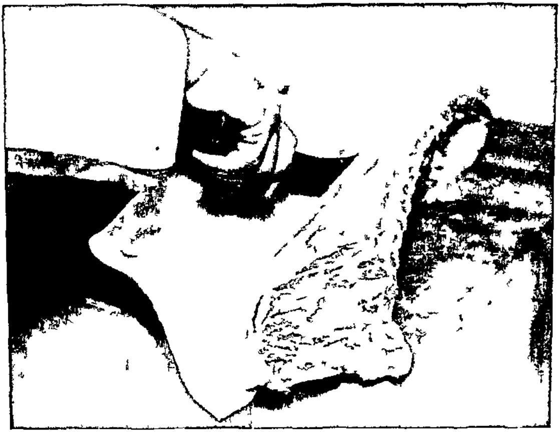


Fig 14 13—Removing the fat back. Heavy fat backs are either dry salted or rendered into lard with other fat trimmings

Cutting Test (Meat vs. Lard Type Hog)

	Meat Type	Lard Type
Live weight	265 lbs	250 lbs
Warm dressed weight jowl on leaf in	197 lbs	191 lbs
Chilled dressed weight jowl on leaf in	194 lbs	188 5 lbs
Dressed yield (warm)	74 34%	76 40%
Dressed yield (cold)	73 27%	75 40%
Shrink (24 hours)	1 07%	1 00%
Carcass length 1st rib to H bone	34 inches	29 inches
Atlas joint to ham hock	52 inches	46 5 inches

Trimmed Primal Cuts per Side

	Meat Type		Lard Type
Ham	17 5 lbs		14 25 lbs
Shoulder N Y style (2 ½ rib)	17 lbs		14 75 lbs.
Loin	11 25 lbs		11 lbs
Belly	14 lbs		15 lbs
Total weight	62 75 lbs.		55 lbs
Yield of primal cuts	47 47%		41%
Fat 18 00 lbs / Leaf fat 2 75 lbs.	20 75 lbs	26 00 lbs / 3 25 lbs.	29 25 lbs
Fat yield	15 65%		23 4%
Back fat thickness	1 4 inches		2.3 inches

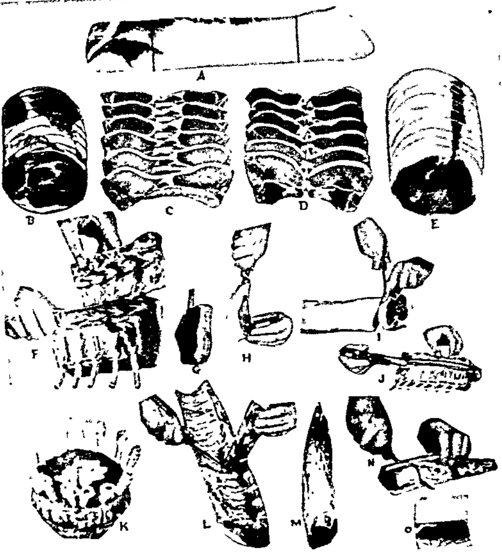


Fig. 14.4—Retail cuts from a pork loin. (A) A pork loin; (B) a bladeless pork roast made by removing the ribs and backbones from two blade end cuts and placing the inside cut surfaces together with the ends reversed; (C)rib chops; (D) loin chops; (E) sirloin pork roast made by taking two hip ends, stripping out the tenderloins and removing the backbones and hip bones and then reversing the ends and placing the two cuts together and tying; (F) removing the backbone and frenching the ribs for French pork chops (G); (H) making an opening 1½ inches long at the end of a chop and cutting a pocket on the inside of the chop for a pork bird; (I) cutting a double slice from a boneless loin (pork sirloin) to make a butterfly chop; (J) sawing parallel to the chine bone to remove the backbone from a rib section of a frenched rib and by using two of these sections and sewing the ends together resulting in (K) a crown roast; (L) removing the pork (M) tenderloin or fish; (N) cutting the tenderloin into two inch pieces and (O) flattening them between two pieces of parchment paper.

Fig. 14.15—Cutting out the spare rib.

practice. Lard should not be rendered in copper kettles, rusty iron kettles, or run through brass valves or fittings because some of the copper and rust are dissolved and combined with the fats, forming oxidative salts that will lower the stability of the lard. Stainless steel is considered an ideal receptacle for rendering. Rust free iron kettles are in general use, aluminum is very satisfactory.

If steam jacketed kettles are not available for the process of

rendering, and the job is done with an open fire, it will be necessary to stir the fat frequently and watch the fire closely to avoid scorching the lard. Continual agitation by stirring gives the most rapid and thorough rendering. The lard is ready to be "drawn off" when the cracklings have become amber in color and no more moisture rises from the lard.

Pressing and Cooling

The lard press should be sweet and clean. A slight coating of last year's rancid lard on the press, or old, ill-smelling containers will lower the quality and hasten the deterioration of the new batch. Lard containers should be scrubbed thoroughly and dried. Several thicknesses of cheese cloth are sufficient to strain out the sediment.

If lard is allowed to cool without any stirring, the lard oil in it tends to separate from the stearin and causes a grainy texture, a characteristic of country lard. To get a smooth lard, set it away in a cool place, and when it becomes creamy, stir it well with a paddle and let it harden. Pork packers plasticize lard by cooling it rapidly on a chill roll or in a Votator chilling machine. Rapid chilling and agitating cause the formation of small crystals which produce a firm, smooth lard. The lard storage temperature should be 40° F.

Packing House Lard

Pork packers have three grades of pork fat: (1) the killing fats (intestinal); (2) the leaf fats; and (3) the cutting fats. Usually these are rendered within 24 hours after the hogs were slaughtered.

The three most important sources of lard obtained from a hog carcass are (1) leaf fat, (2) fat trimmings, and (3) fat backs and plates. About seventy five per cent of the fat backs are rendered for lard, the other twenty five per cent being marketed fresh, frozen or cured.

A medium weight hog grading U. S. No. 1 yields about 12 pounds of lard per 100 pounds live weight whereas the same weight hog grading U. S. No. 3 yields about 16 pounds or 33% more lard.

Kettle-rendered Lard

Steam jacketed kettles with mechanical agitators are used in this method. Leaf fat rendered by this process is known as

Fig. 14.15—Cutting out the spare rib.

practice. Lard should not be rendered in copper kettles, rusty iron kettles, or run through brass valves or fittings because some of the copper and rust are dissolved and combined with the fats, forming oxidative salts that will lower the stability of the lard. Stainless steel is considered an ideal receptacle for rendering. Rust free iron kettles are in general use, aluminum is very satisfactory.

If steam jacketed kettles are not available for the process of

consumer Because the average housewife objected to the blue color, (which is the natural color of pure lard), the manufacturer had to decolorize it, because she objected to its odor, he had to deodorize it, so that it would not become too soft at room temperature, he had to add hydrogenated lard flakes and raise its melting point, in order that it would keep on the shelf as well as in the refrigerator, he had to give it added stability by adding an antioxidant, and, finally, he had to place it in a container that would preserve these added qualities

LARD OUTLETS

The markets for lard are (1) the domestic consumer (including institutional users), (2) the export trade, and (3) use in the manufacture of shortening and margarine Of these three outlets, (1) and (2) have had a slight downward trend while (3) has increased About eighteen per cent went for export, sixty seven per cent for direct use (civilian and military), and fifteen per cent for the manufacture of shortening and margarine

The present high quality lard is easily substituted for other fats in shortening and prepared foods When lard prices are low compared to crude soybean oil, manufacturers of shortening substitute lard for the soybean oil This has helped to stabilize lard prices to the extent that since 1955 quarterly average lard prices have never varied over 1 7 cents per pound from the average annual price and the price of lard and competing fats and oils tend to draw closer to each other

Lard for export must be thoroughly rendered and the containers must be exceptionally strong Some Latin American countries demand a highly flavored or brown lard which they call "Checharron"

LARD AS A SHORTENING

Lard is a natural fat—nothing has been added and nothing removed This is an important factor in its digestibility and nutritive value All fats are highly digestible but their ease of digestion is reported to depend on their melting point In order to convert liquid vegetable oils to lard like consistency and give them increased stability, manufacturers use the hydrogenation process to raise the melting point Lard is practically liquid at body temperature, hydrogenated fats are not

Fats contain varying amounts of linoleic and arachidonic

"open kettle rendered leaf lard" and is the highest grade of commercial lard outside of the neutral lards or the new processed lards. Trimming fats go into "kettle rendered lard."

Steam-rendered Lard

This process consists of bringing live steam into direct contact with the fat in a closed vertical tank or cylinder under a pressure of 30 to 50 pounds. Mostly killing and trimming fats are used. If it is bleached with fuller's earth and refined, it is known as "refined lard."

Dry-processed Rendered Lard

In this process, fats are cooked in horizontal steam jacketed tanks under a vacuum. The three kinds of fat may be rendered separately, or all kinds of pork fat may be converted into lard under this method.

Neutral Lard

This consists generally of leaf or back fats that are rendered in a water jacketed kettle by slowly melting them at 126° F. Neutral lard is white in color, bland in flavor, and finds wide use in the manufacture of butter substitutes.

Lard Substitutes

Substitutes are made of a combination of (1) lard and other animal fats (lard compound), (2) vegetable oils with animal fats, and (3) hydrogenated vegetable oils, the most prominent of which are cottonseed, soya bean, peanut and cocoanut oil.

Lard Oil

Lard oil consists mainly of olein and is made from prime steam lard. It is used in the manufacture of margarine, as a burning oil, and as a lubricant for thread-cutting machines.

Modern Lard

One of the accomplishments of the packing industry during the period of World War II was the improvement made in lard to meet the competition of vegetable shortenings. This new type of lard is no longer rendered pork fat as such. It has been given new treatments and new names.

The processing necessary to produce this new lard has added to its cost and, like all improvements, must be paid for by the

Method but it does have the unusual property of "carrying through" and protecting the foods made with lard from rancidity. However, when 70 parts of propylene glycol, 6 parts of propyl gallate, and 4 parts of citric acid are added to 20 parts of butylated hydroxyanisole (BHA), it has very definite antioxidant qualities.

It is commercially available under the trade name Tenox II, made and sold by Tennessee Eastman Corporation, Kingsport, Tennessee. The recommendations are for the use of 1 pint of Tenox II for each 2000 pounds of lard. Add the Tenox II to the melted lard and stir thoroughly to insure complete distribution.

Stabilizing Home-Rendered Lard

To improve the keeping quality of home-rendered lard, the U. S. D. A.'s Eastern Regional Research Laboratory recommends *the addition of 2 or 3 pounds of hydrogenated vegetable shortening* to every 50 pounds of lard at rendering time, just before settling and separating the cracklings. The shortening should be stirred into the hot lard to get a thorough mix. The vegetable oils used in making vegetable shortening contain vitamin E (tocopherol), which is an anti-oxidant. The addition of the anti-oxidant to home-rendered lard in this manner provides a cheap and easy method for farmers to follow without tangling with vexatious chemical terms.

SCORING LARD

Texture (20 points)

Lard that is allowed to cool slowly without any stirring at the cream stage will become grainy because the lard oil separates from the stearin. This is characteristic of home rendered lard. However, a smooth, velvety lard is desirable, from the standpoint of both appearance and plasticity.

Odor (30 points)

Lard should have the sweet characteristic lard odor, and strong or rancid odors should be scored down.

Color (25 points)

Off color in lard may be due to scorching or to the presence of meat proteins caused by lean meat in the fat trimmings. Both are considered objectionable. A chalk white color is ideal, and any shading into cream or tan must be scored down.

fatty acids, which are essential to the human body. Since the body cannot synthesize a fatty acid, it must be supplied in the diet. In hydrogenation, the nutritionally valuable substance, linoleic acid, is destroyed to make fat more resistant to the development of rancidity. The lard that consumers buy is not hydrogenated and contains an adequate amount of the acid.

Lard is composed of a mixture of liquid and solid fats which gives it a wider plastic range under lower temperatures than hydrogenated fats. This makes it possible to use lard right out of the refrigerator.

Repeated tests have indicated that lard has greater shortening value than hydrogenated fats. By shortness is meant the force necessary to break a standard cracker or pie crust. The lower the breaking strength, the greater the shortening value. This shortening ability results in a flakier and lighter crust.

Antioxidants for Animal Fats

The Meat Inspection Division of the U. S. D. A. has to approve any antioxidant used in animal fats sold in interstate commerce. To date, these approved antioxidants, which must be tasteless, odorless, and non-toxic, and must stabilize the fat by retarding rancidity as claimed, are: (1) Nordihydroguaiaretic acid (trade mark NDGA) with or without citric or phosphoric acid as a synergist (cooperative material); (2) the resin "guaiac" with or without a synergist, developed by R. C. Newton and staff of Swift & Co.; (3) propyl gallate with or without citric acid; (4) tocopheral concentrate in vegetable oil; and (5) A.M.I.F. —72, developed by H. R. Kraybill and staff of the American Meat Institute.

An illustration of (4) is the combination of propyl gallate, lecithin, corn oil, and citric acid marketed by Griffith Laboratories of Chicago, Illinois, under the trade name of G-4. It is sold in both regular and concentrated form, the recommended amount being 2 ounces of the regular to 100 pounds of lard or fat and 6-8 ounces of the concentrate to 1000 pounds of fat. It is also available with salt (5¾ ounces of antioxidant to 100 pounds of salt). This is recommended by the company in seasoning sausage, fried pork skins, potato chips, nut meats, popcorn, peanut butter, etc.

A.M.I.F. —72 has butylated hydroxyanisole as its main ingredient and, when used alone, it is not unusually effective in increasing the stability of lard as measured by the Active Oxygen

Reg. 17, Sec. 9, Paragraph 7

Lard may have added thereto lard stearin or stearin made from lard (hydrogenated lard) without the presence of such added substance being shown on the label.

Reg. 17, Sec. 9, Paragraph 8

When not over 20% of oleo stearin, beef fat, mutton fat, or vegetable stearin is added to lard, there shall appear on the label, contiguous to and in the same size and style of lettering as the name of the product, the statement "oleo stearin added," "beef fat added," "mutton fat added," or "vegetable stearin added," respectively, as the case may be.

Reg. 17, Sec. 9, Paragraph 9 (summarized)

Tin pails, drums, tubs, tierces, barrels, half barrels, and similar containers containing "compound," or "lard substitutes," or "lard compound," shall, immediately after filling, be legibly marked or labeled with the true name of the product.

Mixtures of which the lard ingredient equals or exceeds in amount the other ingredients combined may bear the name "lard compound" preceding the statement of composition.

Reg. 18, Sec. 6, Paragraph 3 (a)

The dyes may be mixed with prepared fats, such as lard and lard compounds.

Reg. 17, Sec. 9, Paragraph 12

When permitted coloring matter is used in the preparation of lard or other prepared animal fats under the provisions of paragraph 3 of Section 6 of Reg. 18, there shall appear on the label in a prominent manner and contiguous to the name of the product, except in the case of oleomargarine, the statement "artificially colored."

Reg. 18, Sec. 6, Paragraph 6

No "compound" lard substitute, lard, or lard compound shall contain added water.

Sec. 1.1 (cc).

Lard. The fat rendered from fresh, clean, sound, fatty tissues from hogs in good health at the time of slaughter, with or

Body (25 points)

Ordinary room temperature (60° to 70° F.) should find lard fairly firm. Oily, soft lard is scored down.

LARD AS A TREATMENT FOR ECZEMA

Finnerud and Kesler of Rush Medical College, Chicago, studied a number of eczema cases in the clinic and hospitalized some for a period of two to seven weeks. After determining the unsaturated fatty acid content of the blood of normal patients and comparing it with those afflicted with eczema, they discovered that half of the afflicted patients had blood with low fatty acid content. Lard was administered through the diet and the patients whose blood had been found to have a low, unsaturated fatty acid content showed an increase. All the patients improved markedly under the treatment, which suggests that there was an unsaturated fatty acid deficiency that could be rectified by the addition of lard to the diet.

FEDERAL LEGISLATION REGULATING LARD (B.A.I. ORDER 211, REVISED)

Reg. 17, Sec. 7, Paragraph 2 (g)

Such terms as "country," "farm," and the like shall not be used on labels in connection with meat and products unless such meat and products are actually prepared in the country or on the farm. However, if the articles are prepared in the same way as in the country or on the farm, these terms, if qualified by the word "style" in the same size and style of lettering, may be used. Lard not rendered in any open kettle shall not be designated as "country style."

Reg. 17, Sec. 7, Paragraph 2 (h)

The word "leaf" shall not be used in connection with lard prepared from fat other than leaf fat. The qualification "prime steam" shall not be applied to lard rendered in whole or in part from fats obtained from cured meats or trimmings.

Reg. 17, Sec. 7, Paragraph 2 (i)

Oil, stearin, or stock obtained from beef or mutton fats at a temperature above 170° F., shall not be designated as "oleo oil," "oleo stearin," or "oleo stock," respectively.

Lard: U. S. Exports, Including Rendered Pork Fat, by Country of Destination, Average 1951-59, Annual 1958 and 1959.*

Continent and Country	Average 1951-55	1958	1959[1]
	1,000 pounds	1,000 pounds	1,000 pounds
North America			
Canada	6,497	5,108	4,096
Costa Rica	7,363	1,751	5,281
Cuba	157,427	165,302	217,083
Dominican Rep	352[2]	47	21
El Salvador	4,299	3,190	2,640
Guatemala	8,668	3,476	8,010
Haiti	6,725	7,246	7,652
Mexico	31,823	14,565	10,543
Netherlands Ant	1,066	295	509
Panama Canal Zone	6,560	7,177	4,787
Panama Republic	967	152	155
Other Countries	1 518	1 375	1 724
Total	233 265	209 684	262,531
South America			
Brazil	2,088		55
Bolivia	3,755	696	6,252
Colombia	3,359		26
Ecuador	5 494		19
Peru	12,521	585	4,765
Venezuela	3,640	402	609
Other Countries	134	268	1,934
Total	30,991	1 951	13,660
Europe			
Austria	23,579	1,100	22
Belgium-Luxembourg	1,005	42	235
France	1,104	140	106
Germany, West	55,978	10 928	39,940
Greece	214	2	
Italy	593	3	26
Netherlands	33 114		1,547
Switzerland	1,725		22
United Kingdom	124,685	146 451	274,603
Yugoslavia	38 431	15,479	7,832
Other Countries	4,825	825	595
Total	285 053	174,970	321,928
Asia	5,197	2,245	3,013
Africa	100		
Oceania	30		
Grand total	554,636	388,850	604,162

[1]Preliminary
[2]Less than 5 years.
*Foreign Agricultural Service Compiled from reports of the U S Department of Commerce

without lard stearin or hardened lard. The tissues do not include bones, detached skin, head fat, ears, tails, organs, windpipes, large blood vessels, scrap fat, skimmings, settlings, pressings, and the like, and are reasonably free from muscle tissue and blood.

Sec. 1.1 (dd).

RENDERED PORK FAT. The fat, other than lard, rendered from clean, sound carcasses, parts of carcasses, or edible organs from

Estimated Physical Composition of the Carcass and Principal Trimmed Cuts from Hogs of Intermediate Type.*

(Proportions of various parts from hogs at indicated live weight at slaughter and chilled dressed weights.)

Cuts and Components	175 lbs. Live 139 lbs. Dressed	200 lbs. Live 158 lbs. Dressed	225 lbs. Live 178 lbs. Dressed	250 lbs. Live 197 lbs. Dressed
	Per Cent	Per Cent	Per Cent	Per Cent
DRESSED CARCASS:				
Separable fat	36.8	39.5	42 2	45.0
Separable lean	40.6	39.3	38 0	36.7
Bone	15.8	14.6	13.3	12.1
Skin	6.8	6 6	6 5	6.2
TRIMMED CUTS:				
Ham				
Separable fat	25.2	27.4	29 6	31.9
Separable lean	59.3	57.6	55 8	54.0
Bone	10.9	10.3	9.8	9.3
Skin	4 6	4 7	4 8	4.8
Loin				
Separable fat	18 3	18.5	18.8	19 1
Separable lean	59.2	59 5	59.8	60.0
Bone	22 5	22.0	21 4	20.9
Bacon				
Separable fat	55 8	58.8	61.8	64.8
Separable lean	36 0	33.7	31 4	29.1
Skin	8.2	7 5	6 8	6 1
Shoulder, full-cut				
Separable fat	26 5	28 0	29 6	31.1
Separable lean	56 9	56 2	55.4	54.6
Bone	11 4	10.7	10 0	9.4
Skin	5 2	5 1	5.0	4.9
Head, full-cut				
Separable fat	23 6	27.1	30 6	34.1
Separable lean	21 1	20 1	19.4	18.7
Bone	38 8	35.9	33 0	30.0
Skin	16.6	16 8	17 0	17.2
Spare ribs				
Edible meat	55.6	58 1	60.6	63.1
Bone	44 4	41.9	39.4	36 9
Shoulder ribs				
Edible meat	37 7	40 0	42 4	44.7
Bone	62 3	60 0	57.6	55.3

*Courtesy, U.S.D.A.

XV.

SAUSAGES

The tonnage of sausage of many different types manufactured in more recent years has been phenomenal. The consumption of frankfurters and soft drinks would have to be included in any mural drawn to depict the American way of life. Peruse the following facts: Approximately one out of every ten pounds of meat produced in the United States is consumed as sausage. Sausage production has become the most profitable segment of our meat packing industry. Sausage, which was once considered to be predominantly a product of pork, now contains more beef than pork in most of the formulas. Sausage has made possible a much greater variety in our meat diet. It has taken an important role in our hurried way of living by giving us quick meals of high nutritive value. It has made use of meats that might have otherwise been lost items for the meat packer. Ironically, the dairy industry, which clamored so long and loudly against margarine, is one of the largest suppliers of sausage beef besides furnishing the milk that is included in the margarine formula.

Approximately 2½ billion pounds of sausage products are currently processed in Federally inspected plants, equivalent to 13.5 pounds per person. Frankfurters, wieners and bologna types accounted for the bulk of the noncanned items, and luncheon meat was the leading canned sausage product.

It is in the sausage business that the manufacturer has his largest field for individual effort in developing new products. Today, without too much effort or searching, one can probably find the edible parts of an entire hog reposing in the supermarket either in a skin, a plastic bag, or a tin.

Sausages have been variously catalogued but may be classified for our purpose as Domestic and Fancy.

hogs in good health at the time of slaughter, except that stomachs, tails, bones from the head, and bones from cured or cooked pork are not included. The tissues rendered are usually fresh, but may be cured, cooked, or otherwise prepared and may contain some meat food products. Rendered pork fat may be hardened by the use of lard stearin and/or hardened lard and/or rendered pork fat stearin and/or hardened rendered pork fat.

several kinds of fresh pork sausage which differ in texture, seasoning, and meat content.

Country Style—This style usually contains from 10% to 20% of beef ground with the fresh pork; it is coarsely ground, using the 3/16-inch plate, and does not contain sage as a seasoning. It is stuffed into hog casings of different sizes and is unlinked. It is also sold loose (unstuffed).

Breakfast Style—This is an all-pork sausage that is finely ground and seasoned with sage, salt, and pepper. It is stuffed into medium and large sheep casings and the smaller size hog casings which are then linked to make the various sized sausages.

A lean sausage (20%-25% fat) with a mild seasoning of sage is probably the most popular but also the most expensive. The incorporation of pork fat cheapens the sausage and increases the cooking shrink. Sausages produced in federally inspected plants cannot contain in excess of 50% trimmable fat. Several sausages such as Bratwurst, fresh Thuringer, and Bockwurst contain some beef and/or veal along with the pork and are not cooked or smoked.

Seasoning Pork Sausage

The farm practice of tasting raw sausage to determine the amount of seasoning is unsatisfactory in that it caters to only one person's desires. The most satisfactory way to get the seasoning nearly right for the greatest number of people is to weigh the sausage and add the following mixture for each 100 pounds of ground pork:

28 to 30 ounces of table salt
6 ounces of black pepper
2 ounces of ground sage

This imparts an excellent flavor and the different batches of sausage will always be seasoned the same. Many prefer butcher's pepper (coarsely ground black pepper) instead of table pepper.

Those desiring a more highly seasoned sausage might try the following formula:

2 lb. salt	3/8 oz. Jamaica ginger
6 oz. cerelose (corn sugar)	3/8 oz. ground mace
3/8 oz. red pepper	3/8 oz. thyme
3 oz. white pepper	2 oz. rubbed sage

DOMESTIC SAUSAGES

Small sausages—Wieners, Frankfurters—In skins or, skinless—smoked and cooked. Fresh: loose or cased. All pork-breakfast style, light, medium, or heavy sage. Pork and beef, coarse ground, country style, no sage. Smoked sausage.

Large sausages (2 inches or over in diameter)—Fine cut (emulsion), Fine cut with ground or chunk meat added, Coarse cut—long or short, round or square—smoked, cooked.
Bologna—beef and pork, smoked and cooked
Kosher all beef sausage—smoked and heat treated
Lebanon bologna—smoked, semi-dry, and uncooked

Summer sausage (regular)
Pork and beef (pork predominating) cooked, not smoked

Summer sausage (Wisconsin style)
Beef and pork (beef predominating) smoked and cooked

Braunschweiger
Liver and pork, cooked (is not smoked if some smoked meat was added)

Liver sausage
Liver and pork, cooked and can be smoked

Luncheon meats
Smoked and cooked or cooked and not smoked

Loaf meats (No M.I.D. limitations on the amount of water, cereal, dried skim milk, or other extenders).
Cooked in water or oven baked—fine chopped (silent cutter); Fine chopped; ground meat or chunk meat added; coarse cut; meat chunks added; cooked: boneless hams, pork shoulders, pork loins pressed in cooking mold; jellied type loaves: souse, head cheese, chicken loaf, jellied tongue, combination meat and cheese loaves, and diced loaves.

The above loaves that are processed in pans or loaf molds can be stuffed into casings and meet the M.I.D. definition of loaves but if they are processed in casings, the loaf falls into the category of sausage, in which the amount of the extenders added is limited to 3½%, either individually or collectively.

Pork Sausage

The term pork sausage is generally implied to mean the ground and seasoned fresh pork product. There are, however,

Processed Sausage

Certain equipment is essential in large-scale sausage production, the most important of which are the grinder, the silent cutter or chopper, the stuffer, the linker, the peeler, and the air conditioned smoker and cooker. The purpose of the grinder is to reduce the pieces of meat to a conglomerate mass of uniform size according to the plate openings used. The beef is ground separately from the pork. The ground beef is then placed in the silent cutter along with the salt, sodium nitrate, sodium nitrite, spices, and seasoning and is chopped fine. The ground pork is added and the mixture chopped to the desired fineness. Since heat is generated in the emulsion by the friction of the high speed knives, it is necessary to add shaved ice to hold the temperature below 60° F. The amount of water added to get the proper consistency of the sausage is governed by law. The M.I.D. regulation states that the moisture in the finished cooked sausage must not exceed four times the meat protein (by analysis) plus 10%. In fresh sausage that is not processed, the moisture is limited to four times the protein plus 3%.

If the colloid mill is used, the emulsion is prepared by one passage through the machine or by using two mills in tandem. Where stuffing and smoking are to be a continuous process without any holding period for curing, it is necessary to add ascorbic acid (¾ ounce per hundredweight) in solution a short time before the end of the chop, otherwise there will be an uncured core in the center of the sausage. Some manufacturers vacuumize their sausage mix before stuffing to remove the captured air since it is believed to give better color stabilization to the sliced product.

Both natural and cellulose casings of different sizes and strengths are used, depending upon the product to be stuffed. Cellulose casings are used for the production of skinless sausages since they are easier to peel. The manufacture of skinless frankfurters without previous stuffing is in limited production. Hand linking has been largely replaced by mechanical linking machines which reduce labor costs.

The most popular smoker is the air conditioned chamber with hot and cold water showering facilities. The heat and smoke are introduced through forced circulation, thereby eliminating dead spots (uneven heat and smoke density). The smoke generators supply a generous quantity of clean smoke in controllable amounts.

The Ground Hog

When an entire carcass is ground into sausage, the yield will be about as follows: 50% to 60% sausage, 20% to 30% fat, and 15% to 20% bone. In other words, a 300-pound hog which dresses 225 pounds should yield 125 pounds of sausage, 60 pounds of fat, and 40 pounds of bone (head, legs, backbone, etc.). A great deal of the fat in bacon can be used in sausage to make up for the lack of fat in the hams and loins. It is preferable to market pork tenderloins and sirloins as fresh cuts rather than sausage.

Sausage Meats

Pork trimmings of four degrees of leanness are listed on the market and are, (1) extra lean, 95%, (2) special lean, 85%, (3) regular, and (4) pork cheek meat. The better grades of all pork sausage are made from one or a combination of these pork trimmings.

Meats suitable for processed sausages (cooked, or cooked and smoked) are bull meat (which has good binding and water absorbing qualities), plates, boneless chucks, cheeks, and hearts in the beef category; pork trimmings, trimmable fats, fat backs, and jowls in the pork line, and boneless veal shoulders and shanks of veal. Such miscellaneous items as tongues, lips, snouts, tripe, weasands, brains, spleen, hog ears, pig skins, and pigs feet are useful as binders or fillers.

In addition, federal regulations permit the use of additives such as nitrate, nitrites, and ascorbic acid in prescribed amounts, also cereals, nonfat dry milk solids, and other nonmeat substances as set forth in the regulations.

Casings (Natural and Cellulose)

Natural casings are the middle wall of the small and large intestines of hogs, sheep, and cattle. Some other organs such as the bung, the bladder, and in the case of the hog, the stomach, are used as containers for special sausages.

Cellulose casings which as yet have not been made edible are available in a variety of sizes, thicknesses, and stretch characteristics. Fibrous casings are cellulose casings which have been reinforced with fibers to give added strength. Cellulose casings are made from cotton linters which are solubilized and regenerated into casings of any desired diameter. The original and largest manufacturer of this type of casings is the Visking Co. of Chicago, Illinois.

1 ounce red pepper
½ ounce garlic powder (dissolved in water)

The seasoned sausage is stuffed into large hog casings in 12 to 14 inch lengths and smoked at 120° to 130° F. until brown. Place the smoked sausage in 170° F. water for 30 minutes, drain, and refrigerate. Kolbassi makes a good cold cut or can be served hot.

FRANKFURTERS AND/OR WIENERS

Although frankfurters (franks) and wieners (hotdogs) have merged their identity, let it be said for the record that wieners as originally formulated were a combination of veal and pork. Today's frankfurters are constituted of many variations of meats and seasonings but having one thing in common, viz.—processing. The following formulas illustrate one of many differences.

Frankfurters

50 lbs. reg. lean beef trimmings	¼ oz. sodium nitrite
15 lbs. fresh bull beef	6 oz. white pepper
35 lbs. fresh lean pork trimmings	2 oz. ground coriander
20 lbs. shaved ice	1 oz. ground sage
5 lbs. dried skim milk	1 oz. ground cinnamon
3 lbs. salt	1 oz. fresh garlic
8 oz. sucrose	2 oz. mace
2 oz. sodium nitrate	

Wieners

35 lbs. reg. pork trimmings	2 oz. white pepper
10 lbs. pork cheeks	2 oz. ginger
30 lbs. veal trimmings	2 oz. coriander
18 lbs. ice	2 oz. mace
5 lbs. milk powder	1 oz. sodium nitrate
12 oz. dextrose	¼ oz. sodium nitrite
2 lbs. salt	

To make skinless franks, peel the next day after wetting with water spray for easier peeling.

Country Style Bologna

80 lbs. lean beef chucks	2 oz. sodium nitrate
20 lbs. regular pork trimmings	¼ oz. sodium nitrite

If ascorbic acid or any of its derivatives have been included in the emulsion for proper color development, the processing can be continuous (without curing period) and is done in three stages, the length of each period depending upon the nature of the product and its size. The first stage consists in drying and warming the product at a temperature set at 130°-140° F., requiring about 15 to 20 minutes. No smoke is admitted during this warm-up. The next stage involves the application of smoke while the temperature is raised gradually to 165° F. and held there until the internal temperature of the product reaches 145°-155° F. The humidity should be maintained at 78°-80° to avoid excessive drying which causes a tough shell to form on the product and interferes with proper peeling. The third stage consists of cooking the product by showering with hot water in the smoker or by removing it to a conventional type water cooker (Jordan cooker) and removing the product when the internal temperature reaches 155° F. It is then showered with cold water for 3 to 5 minutes and allowed to hang at room temperature to dry. When dry, it is placed in a cooler temperature of 45°-55° F.

The coloring of casings has become a standard practice. The M.I.D. restricts the use of coloring matter to the coal tar dyes and the natural coloring substances carotene, cochineal, etc., numbering sixteen in all. The law states that the dye shall not penetrate into the product. Those who do not use colored cellulose casings may add the dye by dipping or include the dye in the recirculating hot water shower.

Kolbassi

This sausage, as its name implies, is of European origin and consists of 80% pork and 20% beef. Pork shoulder meat is ground through a 3/8 inch plate; the beef (chuck, brisket, plate, or shank meat) is ground through a 1/8 inch plate (twice, if desired). The ground beef and pork are mixed and the following cure added (per 100 pounds of meat): 40 ounces salt, 8 ounces sugar, 2 ounces sodium nitrate, 1/4 ounce sodium nitrite (dissolved in 2 quarts of water). Mix the cure with the meat and refrigerate for 24 to 48 hours.

Seasoning per 100 pounds of meat (approximate):

6 ounces black butcher's pepper
2 ounces mustard seed
1 ounce paprika

100° F. Rinse with hot water and hold at room temperature for several hours before placing in cooler.

Liver sausage (*Puddin Meat—Dutch style*)

25 pounds pork trimmings
10 pounds beef or veal
8 to 10 pounds pork liver
4 loaves stale bread or 4 pounds whole wheat flour

If beef or veal are not available, use pork only. The use of pork livers, hearts, tongues, brains, sweetbreads, and kidneys

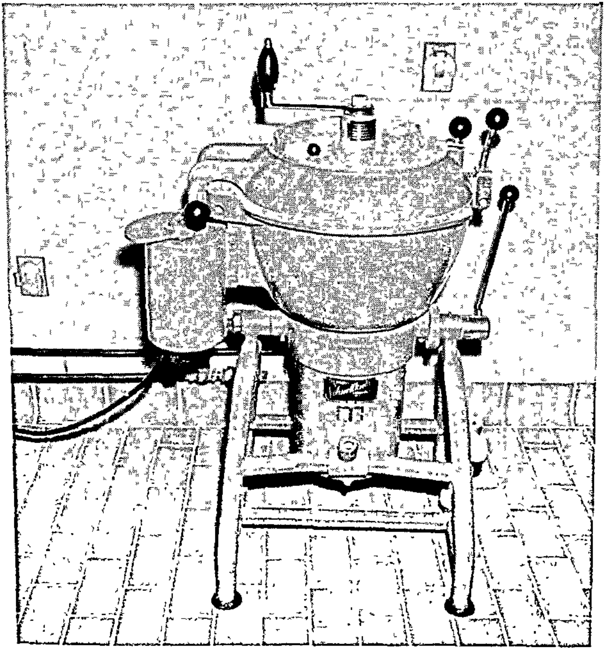


Fig. 15.1—A colloid mill.

10 lbs. shaved ice or water	2 oz. coriander
3 lbs. salt	6 oz. white pepper
8 oz. sugar	

Grind the beef and pork through the ¼-inch plate, season, mix, and regrind. Stuff into small casings in 15-inch lengths and tie the ends together. When dry, place in smokehouse and smoke to desired color and then cook at 170° F. until the inside temperature of the bologna reaches 155° F.

Braunschweiger

Because braunschweiger and liver sausage are such an excellent outlet for pork livers or livers not needed in the retail trade, and because they provide a rather satisfactory profit item, let us see how they are made.

45 lbs. fresh pork livers	2 oz. white pepper
25 lbs. lean pork trimmings	2 oz. sugar
20 lbs. regular pork trimmings	8 oz. braunschweiger seasoning
10 lbs. cured & smkd. bacon ends	2 oz. sodium nitrate
3 lbs. dried skim milk	¼ oz. sodium nitrite
2½ lbs. salt	

The braunschweiger seasoning consists of toasted onion powder, cardamon, mace, and sweet marjoram in the proportion of 3 parts of the onion powder to one part each of the other spices.

The prepared livers (cut into sections and scalded) are placed in the silent cutter or colloid mill and chopped until the mixture becomes pasty and small bubbles appear. Add all the other ingredients with the exception of the pork and continue chopping until smooth. Grind all the pork items through the ⅜-inch plate and then through the ⅛-inch plate and add them to the liver emulsion, chopping just long enough to incorporate them with the emulsion. Stuff into special MP casings (developed by the Visking Co.) in opaque color designed to fit the color of the product. The casings are glossy and moisture-proof and may be printed in multicolored designs to give eye appeal to an otherwise drab looking piece of sausage. Use cooking water at a maximum temperature of 160° F. until an inside temperature of 150° F. is attained. After removing the sausage from the cook tank or hot shower, chill in ice water to an inside temperature of 90°-

Pigs'-Foot Jell or Pig Souse

The pigs' feet should be clean, free from hair, and have the toes removed. Place the feet along with hearts and tongues and shoulder hocks in sufficient water to cover and cook until the meat separates easily from the bones. Cut the meat into chunks and replace it in the broth in which it was cooked and season to taste with salt, pepper, and vinegar. Pour into pans (2 to 3 inches deep) and set away to chill and jell.

Fagots

Fagots are composed of hog livers, hearts, fresh pork, onions, salt, pepper, sweet marjoram, and hog caul fat (fat surrounding the stomach and intestines). The pork is thoroughly cooked and then ground with the raw livers, hearts, and onions. The seasoning is added and the meat is mixed and molded into 6-ounce balls. The caul fat is cut into approximately 7-inch squares into which the meat balls are placed and encased. They are baked in an oven for 45 minutes.

Scrapple

This is distinctly a Pennsylvania Dutch product and a very popular one in the East. Use head meat, feet, hearts, tongues, shoulder spare ribs, fresh Picnic shoulders, or any pork trimmings that contain some fat. Liver may be used if desired. Twenty per cent of the meat used may be beef or veal, but all pork is preferable.

Cook the meat in sufficient water to keep it covered and drain off the liquor when the meat separates readily from the bones. Remove the bones and run the meat through the fine knives of a meat grinder. Place the ground meat and the liquor in which it was cooked together in a kettle and bring it to a boil.

The cereal to be added is best mixed with water or some of the meat juice, adding the juice slowly and working the cereal into a dough with the hand or a dough mixer and then thinning to avoid lumps. The diluted cereal is then poured into the cooked meat and cooked for another 30 minutes. This eliminates the slow process of stirring in the cereal and avoids the formation of lumps.

The cereals used and the amounts are as follows:

1 pound of fine corn meal to 3 pounds of ground meat.

1 pound of buckwheat or rye flour to 10 pounds of ground meat and ½ pound of oat meal to 10 pounds of ground meat.

along with some pork shoulder meat combined with whole wheat flour as a binder makes a product that is very rich in minerals and vitamins and could properly be called *"Vitameat."* Cook the meat thoroughly and grind it through the fine knives along with the bread. To this mixture add 4 quarts of the broth and season to taste with salt and black pepper (chopped onions may be added if desired). Mace, celery seed, cardamon, and coriander are often used to add flavor. After seasoning, cook the mixture another 10 minutes and pour it into pans or crocks to cool and harden.

If liver sausage is stuffed into hog casings, the second cooking is done after stuffing. The sausages are then dipped into cold water to bleach, after which they are hung in a cool place to dry or they may be placed in crocks without bleaching and covered with hot lard to preserve them for future use.

In rural districts, the above product is often referred to as *"Puddin"* meat.

Lebanon Bologna

This is a semi-dry fermented sausage, smoked but uncooked. It originated among the Pennsylvania Germans in the vicinity of Lebanon, Pennsylvania. Since it contains no pork, it is safe to eat without being heat processed.

100 lbs. fresh lean beef	1 oz. ground mustard seed
1 lb. melted lard	1 oz. ground ginger
6 oz. white pepper	2 oz. sodium nitrate
3 lbs. salt	1/4 oz. sodium nitrite
1 lb. brown sugar	2 oz. mace

Grind the beef through the 1/2-inch plate and mix with the curing ingredients (salt, sugar, nitrate and nitrite). Spread in pans and set in cooler for 3 days to cure. Remove from cooler, remix, adding seasoning and the melted lard. Regrind through the 5/64-inch plate and stuff into fibrous casings 3¾-inch in diameter. It is customary to do the smoking in a wooden or wood lined smokehouse using wet saw dust and a temperature between 70°-100° F. The dampers are kept closed to enable the sausage to "sweat." After 24 hours the dampers are opened and the low temperature smoking continued for another six or seven days. At this time the sausages are sprayed with hot water to clean the outside of the casing and allowed to hang at room temperature for an hour or so before being placed in the 40°-50° F. cooler.

h contains very little meat and a large amount of corn meal is made from the broth left over when making liver sausage. is case the broth is thickened with corn meal and buckwheat heat flour as in scrapple and seasoned with salt and pepper.

d Cheese

Skin out the head and remove the jaw bones, eyes, and ears. remainder of the head and jowl are cooked along with some rts and tongues, if desired, and the cooked meat with the e removed is ground and enough broth added to make a thick ridge. This is seasoned with salt, pepper, and marjoram to e and placed in crocks where it takes on a covering of lard, to the excessive amount of fat present in the jowl rising to top. Head cheese usually is eaten cold.

led Ham

This is made from a cured, unsmoked ham by trimming off st of the outside fat and removing the bone. The boning op- tion can be made simple by opening the ham from the stifle it through the center of the ham to the aitch or pelvic bone. oning knife or sharp vegetable paring knife is necessary for s operation. Begin boning at the shank end of the ham and by lowing the bone closely, an amateur can do a fairly neat job. ter the bone is removed, take butcher's cord and tie the ham nly and securely by wrapping the cord around the ham, spac- the wraps one inch apart. Instead of tying the ham, pork ckers place the boned hams in specially constructed ham boil- which compress and shape the ham.

Place the ham in a cooker with water temperature at 170°- 5° F. and process it to an internal temperature of 155°-160° The hams may be allowed to cool in the cooker but are more ten chilled in cold water and then removed from the ham mold be stuffed into a fibrous cellulose casing.

mmer Sausage (Farmer style)

) lbs. lean beef	6 oz. white or black pepper
) lbs lean pork	2 oz. sage or 1 oz. ground mustard seed
½ lbs. salt	3 oz. saltpeter (dissolved in 1 pt. water)
oz. sugar	

Run the beef and pork through the ¼-inch plate of a meat rinder, add the seasoning and the saltpeter, and mix thoroughly.

There should be twice as much broth as there is ground cooked meat. Before the scrapple becomes too thick, season it with salt, pepper, mace, thyme, and nutmeg to taste. The addition of sage is favored by some.

Formula for scrapple:

For 20 pounds of cooked, ground meat use:

2 pounds buckwheat or rye flour; 1 lb. oatmeal
7 pounds finely ground, untoasted corn meal
2 ounces black pepper
10 ounces salt
¼ ounce mace
¼ ounce nutmeg
¼ ounce sage or ¼ ounce thyme

The scrapple is ready to be dipped into pans when it has lost its raw corn meal taste and is thick enough so that it piles up.

Pig Snouts

The ringed and much maligned pig's snout is used extensively in the manufacture of Philadelphia scrapple. The jell in the snout gives scrapple binding qualities. We most often think of a pig's snout as being an instrument of destruction, something for the hog to push into a hole in the fence and follow it through. However, in France we find that pigs are used to hunt truffles, the delicious, highly prized underground tuberous mushroom. Pigs seem to be the only animal that can locate the truffles beneath the ground. Thus, the pig's snout gains in stature in that it can find us food as well as be used for food. We find that Puerto Rican fishermen, who go out of sight of land to fish, carry a pig along in the hold. When ready to return home, they bring the pig on deck. He immediately points his snout in the direction of the nearest land and away they go. So pig snouts make compasses to save lives at sea.

Pan Haus (pon hos)

Some prefer to cook the skinned, split head (jaws and eyes removed), feet, kidney, heart, tongue, liver, and some shoulder meat together and thus use all the odd cuts in making a single product. After these cuts are thoroughly cooked, the bone removed, and the meat ground, the procedure is the same as if scrapple were being made. There is another form of pan haus

100 Pounds Natural Spice	Extract Equivalent in Pounds
Allspice	3.5
Black pepper	1.5
Black pepper (oleoresin)	6.0
Cardamon seed	5.0
Cinnamon	1.0
Coriander seed	0.5
Garlic (imitation flavor)	0.25
Mace	12.5
Nutmeg	12.5
Paprika (oleoresin)	8.0
Sage	2.0

The bacterial contamination of natural spices is of small concern since the amounts used in any product is less than 1% of the total. Sterilized natural spices are available. Tests have shown some antioxidant properties for sage, black pepper, mace, cloves, ginger, rosemary, and thyme in pork sausage. Cardamon, mustard, and coriander are aromatic spices commonly used in sausages, and celery seed is a popular seasoning in loaves.

CANNING PORK, BEEF, OR VEAL

Cut the boneless pieces of loin, ham, or shoulder into convenient pieces to fit the jar. Remove excess fat from the meat, brown in a frying pan, being careful not to let the meat get dry and hard. The meat can be packed raw, but it will not have as good flavor as when browned first. Arrange meat in clean jars. Press down to remove air but do not pack too tightly. Leave a half-inch head space. Add a teaspoon of salt to each quart of meat. Pour fat from the pan over the meat. A small amount of water may be added to the fat in the pan and the liquid poured over the meat. After processing, the meat shrinks and the jar is not full. This will not cause the meat to spoil.

When the jars are filled, carefully wipe off the necks of the jars with a clean cloth, place a tested rubber on each jar, partially seal, and process in a pressure cooker at 15 pounds pressure for 60 minutes for a pint and 70 minutes for a quart. Or meat may be processed in a water bath for 180 minutes for a pint and 200 minutes for a quart. If a water bath is used, the meat should be packed hot and the water should be nearly boiling when the jars are added. The water should be kept boiling during the en-

Regrind through the 3/16-inch plate and spread the sausage on trays. Place in the refrigerator to cure for several days and then stuff into hog casings. Smoke, using wet saw dust, at a temperature of 100°-110° F. until the sausage is a rich to dark brown color. Discontinue the smoke but heat the sausage to an internal temperature of 142° F. Store in a dry, cool (40°-45° F.) place for several weeks before using.

Dutch Loaf

65 lbs. regular pork trimmings (60% lean)	4 lbs. fresh onions
35 lbs. veal trimmings	8 oz. white pepper
10 lbs. dry skim milk	2 oz. sage
25 lbs. shaved ice	2 oz. sodium nitrate
3 lbs. salt	¼ oz. sodium nitrite

Grind the veal and onions through the ⅛-inch plate and the pork through the ¼-inch plate. Place the ground veal and onions in the silent cutter or colloid mill, adding the ice, dried skim milk, seasoning, and cure. Chop for 3 to 4 minutes. Place the ground pork in a mixer and add the emulsion from chopper or mill and mix for 4 minutes. Place in pans and bake at 225°-250° F. for 3 hours or until the internal temperature of loaf reaches 160° F. When cool, stuff in cellulose casings to fit the loaf.

SPICES

The expression that "glue holds the world together" could be applied to spices in a slightly different sense by saying that "spices bring the world together." They come from all parts of the world to give flavor and essence to the foods of all peoples.

The spice manufacturer imports many of these spices in forms unsuitable for consumption until they are cleaned of foreign material and dust, and graded on the basis of quality. They may be ground to different degrees of fineness or the manufacturer may extract the essential oils and oleoresins from the spices for soluble spice extract seasoning. These can be secured in the liquid form or coated on salt and sugar.

The soluble spice is favored where the inclusion of a natural spice would discolor the product, such as sage in pork sausage (use soluble sage). The flavor retention between natural spices and the soluble oil is no different if the product contains equivalent quantities of the active spice.

Summer Sausage or *Cervelat* originated in Germany and is considered to be the most popular of the semi-dry sausages.

Chorizos is a Spanish pork sausage that is coarsely ground and seasoned with Spanish Pimento and sweet red pepper. It is stuffed into hog casings (4-inch links) and given a light smoke and then air dried. The sausages weigh about 3 ounces each.

Capacola is made from boneless Cala butts and is the American substitute for Italian Coppa forte (forte meaning strong), referring to the red pepper pods used in seasoning.

Coppa Picante are Cala butts that have been cured and coated with black pepper. They are molded in square shape and wrapped in cellophane in 2 to 3 pound weights.

Caserta Peperoni is an Italian product consisting of 75% pork and 25% beef, stuffed in hog casings and linked in pairs (12 ounces to each piece). Peperoni are red pepper pods and Caserta is a town in southern Italy.

Farmer Sausage originated with the farmers of northern Europe and is made of 65% beef and 35% pork. It is chopped medium fine, seasoned, stuffed in beef middles, and heavily smoked. Each piece weighs from 1 to 2 pounds.

Gothaer is a summer sausage reported to be impossible to manufacture in any but the winter months (believe it or not).

Goteborg sausage takes its name from the Swedish town of Goteborg. It is composed of 60% beef and 40% pork that has been chopped coarse, seasoned, and stuffed in beef middles. Each smoked piece weighs about 1½ pounds.

Holsteiner is the same as Farmer except the ends are tied together (sometimes called horse-shoe sausage). Dried and smoked, it appears on the market in pieces weighing about 1 pound.

Mett is a semi-dry, 100% pork sausage intended for cooking (it can be fried or boiled). It is a smoked product coming in half-pound pieces.

Mortadella sausage originated in the city of Bologna, Italy, from whence our common ring Bologna received its name. It is 75% pork and 25% beef and the seasoning contains some garlic. Placed in beef bladders, this sausage is not smoked but is pressure steamed for several hours and then dried. Pieces weigh from 5 to 7 pounds.

Prosciutti (pronounced Proshooti) is a dry-cured (black pepper included) Italian ham.

tire processing time. Remove the jars from the processing container as soon as time is up and complete the seal. Stand the jars in an upright position to cool.

Make sausage into cakes, brown, and can them in the same way.

Gas or electric ovens with heat controls may be used to "ovenize" canned meats. In this method the meats are placed in cans or jars in the raw state, adding salt and water as explained above. Tins are sealed, but glass jars are only partially sealed before placing them in the oven. Set the oven temperature at 300° F. and allow two hours' processing for pints and three hours for quarts. If meats are browned before being placed in jars, the time for processing at 300° F. may be reduced by one-half. The glass jars are sealed tight upon removal from the oven. Do not place cold glass jars in a hot oven as the glass is likely to crack.

Pickled Pig's Feet

Remove the hoof section of each foot and make sure that the feet are clean and free from hair. Place them in a 75° pickle for several weeks and cook, chill, and remove the meat from the bone. Place the boned meat in clean jars, add a solution of equal parts of water and vinegar, with a pinch of pepper and a teaspoonful of salt per pint jar. The vinegar solution must be put on hot. Seal the jar and set in a cool place until used.

FANCY SAUSAGES (DRY AND SEMI-DRY)

Most of these sausages are of European origin and take their name from the town in which they originated. The peculiar wrapping and twining are old world identification features. They are either dry or semi-dry and in most cases are ready to serve without any further cooking. The semi-dry sausages are fairly perishable and should be held under refrigeration or in a dry, well-ventilated, or air-conditioned room in which the temperature range is narrow and below 50° F.

Uneven temperatures cause sweating, and a moist sausage surface is, unfortunately, ideal for the development of molds. White molds are not serious as they can be wiped off with a damp cloth but other molds may require the sausage to be soaked in cold water and scrubbed with a stiff brush. Molds are objectionable and should be avoided.

stitute the filling. The roasting period is from 2 to 3 hours, depending upon the size of the roast. Large quantities of pig stomachs are used in the manufacture of sausage.

Tripe

The first and second (rumen and reticulum) stomachs of cattle make up the bulk of the tripe sold under that name. Pig, calf, and sheep stomachs are also made into tripe but are put to a different use. To clean the cattle stomachs, scald at 128°-130° F. for 15 to 20 minutes, using one pound of soda ash per 25 gallons of hot water. When the stomach lining is loose, scrape with a dull knife to remove the lining, and give several washings. Tripe is considered to be clean when the water squeezed from it is as clean as the rinse water. The cleaned tripe can be cut into large or small pieces and pickled in a 60° salt brine or cooked and pickled in a weak salt and vinegar brine. If it is preserved in dry salt and air dried for future use, it should be stored in a cool dry place.

Casings

The small intestines are cleaned and used for sausage casings. On the farm it is best to clean them while fresh. The only tools necessary for cleaning are a piece of flat, smooth-surfaced board and a straight-backed knife. Cut the casings into convenient lengths (6 to 10 feet) and start scraping with the back of the knife at a point midway between the ends. This eliminates having to push the contents the whole length of the 6 to 10 foot piece. With the casing on the smooth-surfaced board and the pressure exerted by the smooth straight back of the knife, nothing but the clean membranous walls of the intestine will remain and the turning of the casing for further cleaning is not necessary. In large scale operations, intestines intended for casings are soaked and slimed and then run through scrubbing machines. The cleansed casings are salted if they are not to be used for several days. Dry salted casings can be purchased from packers or casing houses in hanks or tierces at so much per pound. Salted casings must be soaked and rinsed free of salt before using.

Calcium Pectinate

A new pectinate material which can be made from citrus peel or apple pomace and which can be used as a soluble protective covering for sausage and other meat and food products was de-

Sopressata (a word used to designate any sausage stuffed in crinkly hog middles) consists mainly of pork that is coarsely chopped and has whole black peppers as one of its condiments.

Salami, of which there are a number of varieties, is characterized by its coarse chop and spicy flavor. Practically all contain garlic and have as their containers either sewed hog casings, beef middles, sewed beef casings, beef bungs (cooked salami), or, as in the case of Kosher Salami, kosher beef weasands. Pork is the main meat used, along with some beef. Salami is distinctly an Italian sausage with different variations of twining or cording. B. C. Salami, for example, has only a few vertical and horizontal cordings, whereas Genoa Salami has many wrappings of twine, both vertical and horizontal, in basket weave effect. Some of the Salami sausages on the market are as follows: B. C. Salami; H. C. Salami; Genoa; Savona Genoa; Milan; Arles; Nola; Sicilian or Sicani; Lola; Cooked Salami; Liguria Salami; Lombardia; Kosher Salami; Alessandria; Lazio; Novaro; Catania; Bobbio; Sorrento; Ancona; Capri; Corti; Cotto; De Lusso Genoa; Golden West Milano; Cotechino; Salamina Corti; D'Annunzio; La Triestina; Caruso Genoa; Fiume; Margherita Salami Cotto; Margherita Milano; Venezia; and others.

Thuringer is a summer sausage that originated in Germany in the ancient province of Thuringia. It consists mainly of beef with a small amount of pork and generally comes in 6 to 8 pound pieces.

Use of Intestinal Tract

Pig stomachs are trimmed and cleaned, and either made into sausage containers or cooked as tripe for sausage manufacture. The inner linings of pig stomachs are used in the manufacture of pepsin.

Roasted Pig Stomach

A practice among the Pennsylvania Germans is to make an opening in the stomach about 3 inches long where the gullet makes its entry. The stomach is turned inside out and washed thoroughly. It is then immersed in hot water (150° to 160° F.) to loosen the lining and facilitate its removal. Another method is to remove the lining without scalding, in which case it is necessary to wear canvas gloves in order to grip the membrane.

Several pounds of sausage mixed with sufficient bread and diced potatoes, and seasoned with parsley, salt, and pepper, con-

content of sausage. This regulation is based on the theory that meats contain water and protein in a proportion of less than 4 to 1. Moulton, Trowbridge, and Heigh at the Missouri Agricultural Experiment Station found that fat-free flesh of animals at different ages varied from 80% water and 17.5% protein in calves at birth (4.6 to 1 ratio) to an average of 76.5% water and 21.88% protein in fresh beef (3.5 to 1 ratio). Fresh pork fat ran 7.5% water and 1.5% protein (5 to 1 ratio) with fresh beef fat testing 20.5% water and 4.8% protein (4.2 to 1 ration).

To make a product of the texture and consistency desired by the trade it has been found necessary to add water to sausage formulas or recipes.

Since the meats are run through a chopper equipped with rapidly revolving knives that cause the mass to heat because of friction, the water is added in the form of ice to keep the mass cool. A great deal of cured beef and pork, which has lost moisture in curing, is used. Cooking and smoking result in further drying and unless water is added in the manufacturing process, the product will be too dry. The Government recognized this fact when it ruled that 3% to 10% water above that calculated by multiplying the protein content of the sausage meat by four might be added. On this basis, a batch of sausage analyzing 15% protein may contain 4 times 15% or 60% water, plus an additional 3% for non-cooked sausage and 10% for cooked.

The Use of Nitrate and Nitrite in the Curing of Sausage

Not more than 3 ounces of either potassium or sodium nitrate, nor more than ¼ ounce of nitrite, per 100 pounds of meat are permitted by federal regulation (B. A. I. order dated Oct. 19, 1925). If both are used in a mixture, the nitrite must not exceed ¼ ounce and the additional nitrate must be such an amount as not to give a total of the two in excess of 3 ounces.

FEDERAL LEGISLATION REGULATING SAUSAGE MANUFACTURE (B.A.I. ORDER 211, REVISED)

Reg. 18, Sec. 9, Paragraph 1

The only animal casings that may be used as containers of any meat or product are those from cattle, sheep, swine, or goats.

Reg. 18, Sec. 6, Paragraph 4

Sausage shall not contain cereal, vegetable starch, or vegetable flour, individually or collectively, in excess of 3.5%.

veloped by the Bureau of Agricultural and Industrial Chemistry. The meat or meat product is dipped into the warm calcium pectinate solution (gels at 104° F.) for three seconds, removed, and the gel coating dried in a current of warm air for 30 minutes. A firm film coating of good strength is formed and the treated product can be stored. Boiling the product dissolves the film and in frying or roasting the coating can be consumed with the meat as it is tender and edible.

Chitterlings

The small and large intestines of hogs are emptied and rinsed thoroughly but not scraped. When cooked in this form they are commonly known as "chittlins." They are relished by certain races of people.

Fried Pig Skins

Meat Inspection Division memorandum No. 119 permits the use of names such as "Fried Pork Skins," "Fried Bacon Skins," or "Fried Bacon Rinds" to designate the finished product when fried pork skins are prepared from skin removed from smoked pork bellies.

Pronto Pups (Wieners dun in a bun)

A wiener or frankfurter is impaled upon a wooden skewer and dipped into a quick cooking bread coating. With ¼ to ⅜ of an inch of coating adhering, the wiener is placed in an oven and baked.

Spud-dog

Bore a ¾-inch hole lengthwise through the center of a potato, insert a skinless wiener and bake.

Smoked Sausage

Country style sausage is supposed to be better for smoking because the added beef makes it a leaner product that will not shrink and wrinkle in the smokehouse. This is true when the heat of the smokehouse is too high; however, a temperature between 90° and 100° F. will not wrinkle an all-pork sausage, and a 5 to 7 hour smoke is generally sufficient.

ADDED WATER IN SAUSAGE

Reg. 18, Section 6, paragraph 5, of the Bureau of Animal Industry Order 211 as amended was set up to control the water

product shall be marked with the specific name of each of such added ingredients, either on the product, on the labeled package, *or in the case of small varieties not packed, on the links bearing* the inspection legend.

Reg. 17, Sec. 9, Paragraph 3

When meat food products in casings other than sausage are placed in wrappers, cartons, or other containers, they must be labeled "imitation" and the ingredients stated except the following products that are labeled with their true names: coppa, capacola, lachschinken, bacon, pork loins, pork shoulder butts, and like cuts prepared without added substance other than curing materials or condiments; meat rolls, bockwurst, and similar products in casings which do not contain cereal or vegetables; head cheese, souse, sulze, scrapple, blood pudding, loaves, luncheon meats, and chili con carne.

Reg. 18, Sec. 7, Paragraph 2

Sausage prepared or packed in oil shall be heated to a temperature of at least 160° for not less than 30 minutes.

Reg. 18, Sec. 6, Paragraph 4 (a)

The term "sausage" shall be construed to include head cheese, liver pudding, and blood pudding.

Reg. 18, Sec. 6, Paragraph 5

For the purpose of facilitating grinding, chopping, and mixing, not more than 3% of water or ice may be added to sausage which is not smoked or cooked; sausage of the type which is smoked or cooked, such as Frankfurt style, Vienna style, and Bologna style, may contain not more than 10% of added water to make the product palatable.

Reg. 18, Sec. 6, Paragraph 13

Milk, skimmed milk, dried milk, dried skimmed milk, malted milk, and analogous substances and products which may be approved for such purposes by the Secretary of Agriculture, may be added to sausage, provided their use does not result in added water or moisture in excess of the amount permitted in Paragraph 5 of this Section. Sausage shall not contain any dehydrated milk product in excess of 3.5% and if cereal, vegetable starch, or vegetable flour is also added, the combined amount of these materials and dehydrated milk product shall not exceed 3.5%.

Reg. 16, Sec. 3, Paragraph 2

Casings that are colored and used as containers of meat or meat product shall be legibly and conspicuously marked by branding or printing thereon one of the statements as follows: "Artificially colored," or "casing colored."

Reg. 18, Sec. 6, Paragraph 2 (Revised)

There may be added to meat and meat products common salt, sugar, wood smoke, cider vinegar, wine vinegar, malt vinegar, sugar vinegar, spirit vinegar, pure spices, saltpeter, nitrate of soda, and nitrite of soda. Benzoate of soda may be added to meat and meat products only when declared on the label.

Reg. 16, Sec. 3, Paragraph 1

When cereal, vegetable starch, starchy vegetable flour, or a dried milk product is added to sausage within the limits prescribed under Paragraph 13 of Section 6 of Regulation 18, the

on the hind quarter. During the war emergency, one rib was cut on the hind quarter.

The quartering is done by inserting the knife at the desired spot below the rib eye muscle and making a smooth cut, following the rib through the eye muscle to the backbone. The knife edge is then reversed and the cut extended in the other direction until within six to eight inches from the edge of the flank. The backbone is severed wih a saw and the fore quarter allowed to

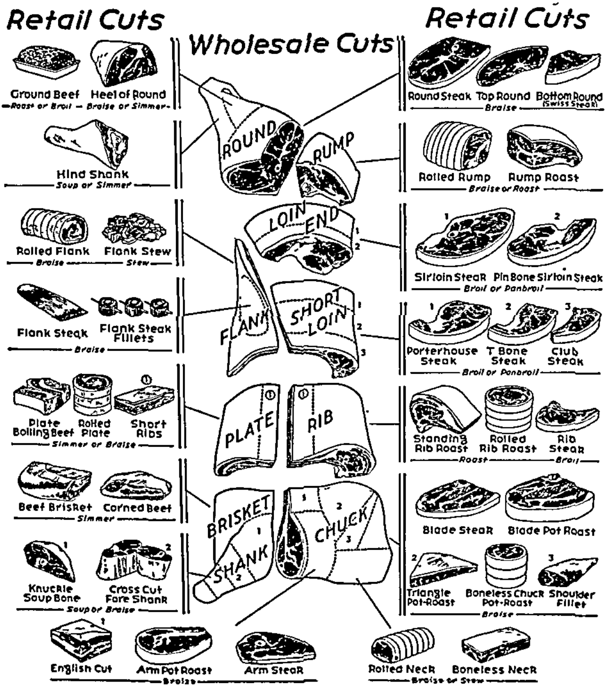


Fig. 16.1—Chicago style.

XVI.

THE BEEF CARCASS AND ITS CUTS

Unlike the cutting of veal, lamb, and pork, the methods of cutting beef are varied, differing somewhat in practically every section of the United States. The primary reason for this condition is traceable to the buying habits of the public which more or less resents a method of cutting which does not furnish the traditional cuts. An outstanding example of this condition is found in Philadelphia and vicinity where the "pin bone" roast and the "bolar" roast are cuts unheard of in other sections of the country.

The greatest standardization in cutting beef exists through the Middle West and West and the method used is referred to as the *Chicago* or *Western* style of cutting beef. The method employed in the Eastern Seaboard States is known as the *New York* or *Eastern* style of cutting beef. A third method which will be referred to in this text as the "National" style of cutting a beef carcass, was developed by the National Livestock and Meat Board by combining what they considered were the best of the various methods employed in all sections of the United States. This style is representative of the best method of cutting for the proper utilization of the different cuts, and will be the only one discussed here in detail.

RIBBING OR QUARTERING

A beef carcass consists of two sides, the right or tight side (the kidney hugs the carcass), and the left or loose side (the kidney hangs away from the carcass). A side of beef is ribbed or quartered by dividing it into a fore and a hind quarter. In quartering beef, all the ribs are left on the fore quarter for the Brooklyn and Philadelphia markets but three ribs are included on the hind quarter for the Boston market. Most other markets cut one rib

The Fore Quarter

When handling beef in the quarter, the left fore quarter is carried on the right shoulder by placing the arm under the shank as a hold for balancing, and then walking against the quarter until it rests on the shoulder; the right fore quarter is carried on the left shoulder. When placing a fore on a meat hook, the outside of the quarter should be against the body of the carrier and the quarter should be hooked near the rib end of the plate,

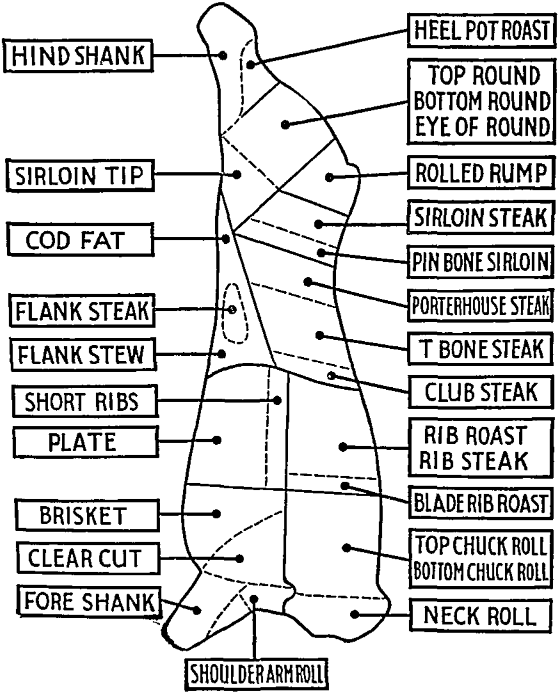


Fig. 16 3—National style

hang on the uncut flank end from which it is easily severed with a knife.

The number of ribs left on the hind quarter affects the percentage of the quarter to the carcass. The three-rib hind represents about 50% of the side, whereas a hind without any ribs represents only 46% to 47% of the side. One-rib hinds represent 48% of the side.

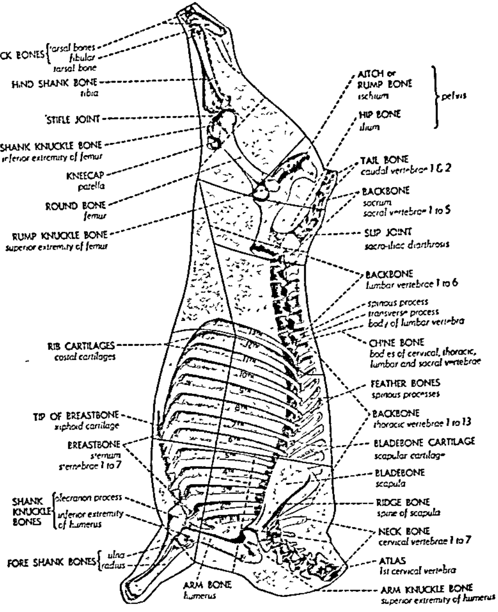


Fig. 16.2—Bovine anatomy.

catching two ribs. When placing a fore quarter on the meat cutting block, the inside is placed down on the block for the National style of cutting, but the reverse is true when following the Chicago style.

Wholesale Cuts (Fore Quarter)

A fore quarter, when cut Chicago style, is divided into chuck, rib, and plate. Plates, in turn, are divided into shank, brisket, and short plate. The same wholesale cuts are made in the Na-

Fig. 16 6—Fore quarter cuts (the rattle). (A) Separating the rattle and back by cutting from the twelfth rib through the knuckle joint, (C) the rattle consisting of the clear cut shoulder (B), the brisket (D), the shank and arm, and the short plate (E) Short ribs (G) may be cut from the plate or it may be boned and rolled (E) as a rolled plate. The shank is either cut into shin soupbones or boned out for stew or ground beef. The meat anterior to the arm bone can be made into a shoulder arm roast, but is better adapted to stewing and ground beef (made into beef patties F).

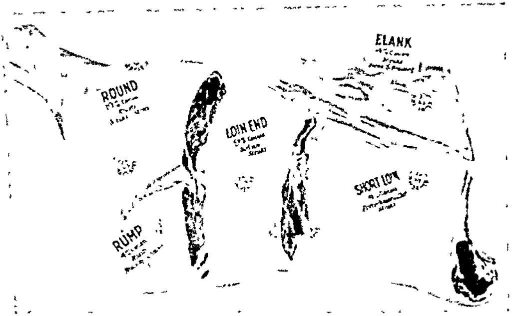


Fig. 16.4—Percentages of wholesale hind quarter cuts, Chicago style. (Courtesy, Armour & Co.)

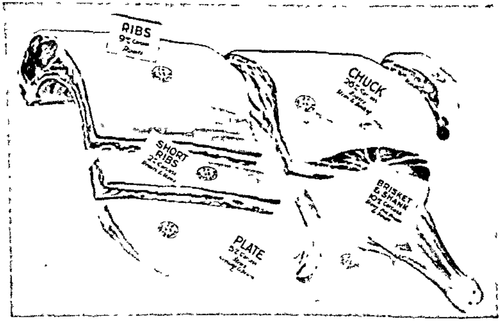


Fig. 16.5—Percentages of wholesale fore quarter cuts, Chicago style. (Courtesy, Armour & Co.)

tional style of cutting but differ in that the arm of the chuck is left on the plate or rattle.

Separating the Back and Rattle

Having located the shoulder joint (where the humerus joins the scapula), the cut is made from a point on the rib where the muscling is thinnest to a position about an inch below the shoulder joint, when a sharp upward swing is made across the joint. The blade bone lies almost at a right angle to the arm bone, making it necessary to swing through at an angle. Pressure is then exerted on the shank so it may be disjointed from the blade bone and the ribs sawed.

The Rattle

The rattle consists of the arm, shank, brisket, and short plate. The heavy muscle back of the arm bone is called the *clear cut shoulder* or the *shoulder clod.* This makes a very desirable pot roast or may be cut into steak for Swissing. On the Philadelphia market, the lower half of this cut is called the *bolar roast.* Australians' name for shoulder clod is bladebone steak meat.

The meat in front of the arm bone is removed and can be made into a *shoulder arm roast,* although it is better suited for stewing or ground meat. In the Chicago style of cutting, the arm is cut into *arm roasts* (also called cross rib roasts) or *arm steak* by cutting across the arm bone.

The thin end of the fourth and fifth ribs is cut into a braising piece called the *English cut.* The fore shank is cut into *shin soup bones* or trimmed out for ground beef (*hamburg*).

The brisket is boned and may be rolled and used as *brisket roll* for pot roasting or it may be diced for stewing, cut into one-inch square for New England dinners, or corned as one flat piece. This last is the most general use made of briskets.

The skirt is the diaphragm muscle on the inside of the fore quarter. It is removed by cutting close to the plate. After a small strip is cut from the outside edge, the membrane is easily pulled from both sides. The skirt can then be rolled and skewered and sliced into *skirt steak patties.*

The plate is cut either across the rib, making strips two to three inches wide, which are then rolled (short rib roll) for a pot roast or cut into individual short ribs. It may also be boned and

Fig. 16.7—Fore quarter cuts (the back). (A) A seven-rib cut showing the sixth or blade rib being removed to be boned and made into a blade rib roll (C); (B) the chuck which can either be cut into roasts with bone in or the ribs and backbone can be removed, the neck cut off in line with the rib side of the chuck, and the squared chuck then separated into (D) inside and outside chuck and rolled; (F) outside chuck roll; (H) inside chuck roll; (E) making a rib roll; (G) the rolled rib roll. The neck may be used for hamburg, and is a good cut for mince meat.

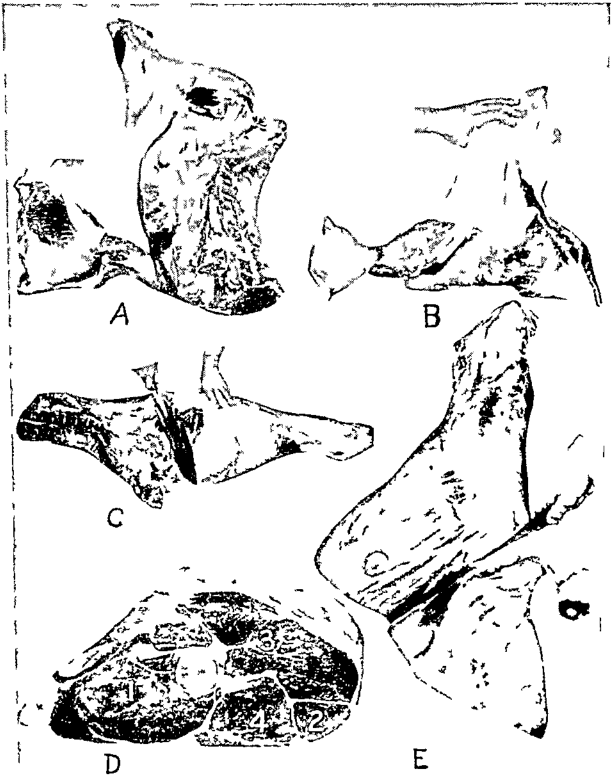


Fig 16 8—Cuts from the hind quarters (A) Removing the flank from a hind, (B) pulling out the flank steak after the membrane was removed (C) separating the round from the rump and loin, (D) the face of the round showing the location of 1 the sirloin or round tip 2 the eye of the round 3 the top round, and 4 the bottom round, (E) removing the round tip or knuckle cut.

made into a *plate roll* for pot roasting or cut into stew or ground meat.

The Chuck

Five ribs are cut on the chuck. Roasts made from this cut are known as *chuck* or *blade rib roasts* and are used for pot roasts. Steaks cut from the same position are called *chuck steak* or *blade steak* and in the better grades of beef are suitable for Swissing. The shoulder joint is used for a soup bone.

The chuck may be boned and divided into top (outside) and bottom (inside) chuck. The division is made along the blade bone. The neck is removed two to three inches farther back than in the Western style and includes the prescapular lymph gland which is a large fat gland lying in the base of the neck. This gland should never be included in a retail cut but is removed and sold with the shop fat. The neck can then be rolled, covered with sheets of cod fat, and tied into a neck roll, or sold as ground meat, as meat for making mince meat, or for stew. The wide yellow band located along the top of the shoulder is called the "back strap." In Australia it is called the "paddy whack." It consists of elastin and is insoluble in water.

The Rib

The rib will consist of anywhere from five to eight ribs, depending upon the number of ribs that were left on the hind quarter. The sixth rib contains the tip of the blade bone and is not as suitable for a standing rib roast (bone in) as the remainder of the ribs. Removing the blade bone and the rib and making it into a roll is generally recommended, although it can be made into an outside and inside roll, a practice that is well suited to a heavy sixth rib. In the Philadelphia area, the fifth and sixth ribs are cut as a two-rib roast and find wide use in the restaurant trade.

A rib roast with the inside projection of the backbone cut off and the rib sawed in two at the end of the rib eye muscle is called a *standing rib roast*. A rib with a two-inch piece of the rib removed midway between the rib end and the backbone to permit the end to be folded over is called a *folded rib roast*. A boned and rolled rib is termed a *rib roll*.

A recent practice is to cut out the rib eye of the better grades of ribs and serve them as *club steaks*. The thin end of the rib is then used for short ribs.

mately 40% of the flank is shop fat, depending upon the grade of beef.

Round

The butcher's round is separated from the rump and loin by making a cut in back and close to the aitchbone and parallel to its posterior end. The main difference between the two styles is that part of the bottom sirloin (Chicago style) is left on the round cut (National style) known as the sirloin tip or "round tip." This is a distinct advantage since it permits the round tip steak to be cut across the grain, whereas in the Chicago style the bottom sirloin (part of round tip) is cut with the grain. It also reduces the size of the sirloin steak which is a decided advantage in this age of small cuts.

Round steak may be cut as one large slice but a more satisfactory method is to bone out the separate large muscles of the round. Locate the stifle joint and make a cut parallel to the round bone (femur) on the top side. Then turn the round with the bottom round up and follow the membrane that separates the bottom round from the sirloin tip. Loosen the patella or kneecap and pull the *round tip* from the round bone. This cut is also called the "knuckle" piece in the dried beef set.

The *top round, eye of round,* and *bottom round* muscles are more readily marketed as steaks or roasts of the proper size than they would be otherwise. The *top round* muscle furnishes a higher quality steak than either the eye or bottom round and is generally priced higher than either of the other cuts. It is suitable for making *chip steak* which are slices cut either No. 5 or No. 6 on the slicing machine. So-called *ducks* can be made by cutting a top round steak one to one-and-a-half inches thick and making a pocket in it for stuffing. *Birds* are made from top round when cut one-fourth inch thick and divided into three-inch strips. The housewife rolls a filling or bacon strips into these strips in the manner of making a jelly roll. Top round, cut from one to two inches thick, is also an excellent cut for Swiss steak.

The eye muscle of the round is one of the most inviting cuts of beef, being mistaken by the average customer for the fillet of beef (tenderloin). It is cut into single or double slices for Swiss steak and is a very handy cut from which to make individual *cube steaks* (one-half inch thick slices run through a cubing machine). It is used also as a pot roast.

The Hind Quarter

A hind quarter is balanced on the shoulder of the carrie with the outside resting on his shoulder and the flank next t his neck to avoid the sharp edge of the backbone. The shan should be to the rear so that he may either back up to a hook o slide the quarter down into his arms with the hock up.

A hind is placed on the cutting block with the outside on th block.

Wholesale Cuts

The wholesale cuts in a hind quarter consist of a butcher' *round* (*minus rump*), *round* (*with rump*), *rump*, loin (*wit* flank, kidney, and suet), trimmed loin (flank off, kidney an suet out), loin end or hip loin, short loin (kidney and suet in) trimmed short loin (kidney and suet out), and flank. In th Eastern style of cutting the butcher's round represents abou 20%, the rump 5%, the loin end 8%, the short loin 8%, th flank 3½%, and the kidney 3½% of the carcass.

Removing the Flank and Kidney

The kidney or knob is pulled out but care must be taken t remove only the knob and not the fat next to the loin.

To remove the flank, start up on the round and circle th round until the outside flank muscle is reached, then cut throug the flank to a point on the rib where the muscle is the thinnes (a full span of the hand from the backbone). The O.P.A. star dard was a 7- or a 10-inch rib.

The membrane is removed from the inside of the flank an the pear-shaped *flank steak* pulled out. The flank steak shoul be scored (cut across the meat fibers) if it is to be used as steak for Swissing or it can be rolled lengthwise around a cor of beef suet with skewers spaced one inch apart; this permit cutting the muscle into *flank fillets*. The trade often request the retailer to make a pocket in the flank steak for stuffin This requires a sharp knife, and the opening should be mad along the side of the muscle. A more satisfactory way for th housewife to fill or stuff a flank steak is to roll the steak lengtl wise around the filling, placing strips of cured bacon over th top side for self-basting purposes. The thick, meaty end of th flank can be cut into a square or rectangular *flank roast* with pocket for stuffing or used for stew or ground meat. Approxi

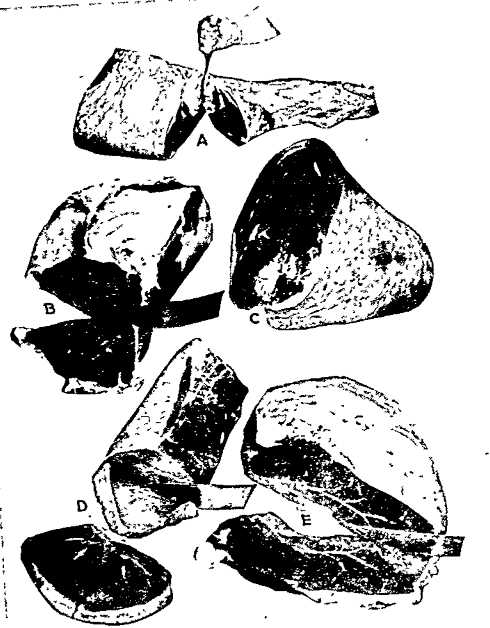


Fig. 16.9—Cuts from the round. (A) Removing the heel and shank from the round by cutting parallel with the face of the round through the knuckle joint; (C) the heel of the round pot-roast; (B) the bottom or outside round (biceps femoris); (D) the eye of the round (semi-tendonous), showing both a single and double slice; (E) the top or inside round (semi-membranous).

Fig 16 10—Cuts from loin and rump (A) Cutting the rump from the loin, (B) a boneless rump roast, (C) cutting a sirloin steak from the rump end of the hip loin, (D) a T bone steak cut from the rib end of the short loin, (E) a porterhouse steak cut from the hip end of the short loin, (F) club steak cut from the extreme rib end of the short loin (includes no tenderloin muscle), (G) a mock turtle of beef, made from two flank steaks which have been scored and cut oval in shape Ground beef or sausage is placed between the two steaks in such a manner as to raise the top steak and give it the curved appearance of a turtle's shell Split wieners are used for legs and flank steak trimmings for the head and tail

or wedge bone sirloin. The pin bone section is made salable by removing the hip bone.

The short loin (hip bone to last rib) is the section from which some of the most desirable steaks are secured. The first four or five steaks taken from the hip end are called *porterhouse* steaks. They have a fairly large tenderloin muscle and plenty of kidney fat. *The tenderloin muscle (the small muscle under* the backbone) tapers out as it approaches the ribs and cuts from this end are termed *T-bone steaks*. The porterhouse and T-steaks contain the T-shaped bone and are often called T-bone or porterhouse interchangeably. The several steaks cut from the rib end of the short loin are called *club steaks*. They do not contain any tenderloin muscle.

The Boneless Loin

A beef loin when boned consists of three boneless cuts: (1) the loin strip (top muscle of the short loin), (2) the boneless sirloin (loin end muscle), and (3) the fillet or tenderloin muscle. The steaks cut from the loin strip are called *strip steaks*. They appear on menus either as club or sirloin strip steak.

Larding

The introduction of strips of pork fat into the body of lean roasts by means of a larding needle is known as larding. It is not used to any large extent since the practice of pounding sheets of cod fat for covering lean roasts was introduced.

A CUTTING TEST

A vendor of meats must know the approximate per cent of all the trimmed (ready to sell) retail cuts that can be made from a primal cut or carcass of the grade he is handling. Some depend upon reputable price-making charts, while others determine their own prices. To do this, it is necessary to make a cutting test which means that a wholesale cut, quarter, saddle, side, or carcass of a specified grade must be cut to determine the salable meat in pounds and percentage. After these tests have been made and the percentages determined for the method of cutting employed by the retailer, providing these tests cover all grades sold in that particular shop, it will not be necessary to make further tests, except for occasional checking.

Cutting Test on a Fore Quarter of Choice Beef National Style

Material—Beef Fore *Grade*—Choice *Weight*—174 Lb.

Assumed Cost per Lb.—30c Total Cost—$52.50

33⅓% of cost ($52.20) equals $17.40, which is 25% gross profit on sales.

Cut	Lb.	Oz.	Per Cent	Retail Price Per Lb.	Value	
Boneless						
Clear cut shoulder	8	8	0489	65	5 52	Suppose a fore quarter of beef of the same grade weighs 155 pounds
Top chuck roll	14	0	0805	59	8 26	
Bottom chuck roll	20	0	1149	60	12 00	
Fore shoulder roll	4	12	0273	45	2 13	To determine the yield of the retail cuts, multiply the 155 pounds by the figures in the percentage column
Brisket roll	12	8	0718	55	6 87	
Hamburg	34	8	1983	47	16 22	
Fat	20		1149	03	60	
Bone	29		1666	01	29	
Bone in						
Standing rib	20		1149	70	14 00	
Short rib	10	12	0618	35	3 76	
	174	00	100%		$69 65 $52 20	cost

$69 65—$52 20=$17 45 (25% gross profit on sales)

effect of chilling and withholding feed as against warm housing and adequate feeding. When the cattle were chilled and fed, no dark cutters were produced, while those from which the feed was withheld in addition to the chilling produced some dark cutters.

A test on commercially fed cattle to check further the effect of chilling and withholding feed on the color of beef substantiated the former results, indicating that dark cutters are produced in direct relationship to the severity of the treatment given the cattle prior to slaughter.

Laboratory Problem

Furnished with a beef loin with kidney and suet in, the wholesale price of which is . cents per pound, bone the cut and

DARK CUTTING BEEF

The color of beef muscle will vary with the age of the animal, ranging from the bright cherry red in yearlings and two-year-olds to the deeper shades of red characteristic of older animals. Occasionally the meat from one of these younger, well finished animals that would ordinarily have a bright red color, will have a very dark red color, in fact so dark that it appears somewhat black. This dark cutting beef had been a rather vexing problem to the producer and processor of meat and it was not until 1940 that some light was shed on the probable causes.

In the fall of 1938, the National Livestock and Meat Board initiated the study of the factors responsible for dark cutting beef. The technical committee appointed was made up of members of the research staffs of the National Livestock and Meat Board, the American Meat Institute, Armour & Co., Swift & Co., and Wilson & Co. Numerous cooperating agencies made the facilities for this work rather impressive.

The first record made on 308 4-H Club calves shown at the 1938 International Livestock Exposition showed that 2.6% were black, 5.8% dark, and 9.4% shady. The greatest number of dark cutting cattle came from the packinghouse that held the calves in outdoor pens (exposed to the cold). Studies made on the rib eye muscle of these cattle revealed a correlation between the color of the muscle and its water extractable sugar content. Dark cutting muscle contained .03%; shady muscle .11%, and light colored muscle .18% sugar. The pH of dark muscle was found to be 6.53, shady muscle 5.68, and light muscle 5.58.

Studies made on 228 cattle during the summer of 1931 indicated that the incidence of dark cutting beef is not increased by fasting the steers as long as three days. Where experiments were repeated on cattle exposed to severe weather conditions with insufficient food, the percentage of dark cutters increased. An experiment in which insulin was administered to the cattle showed that it was possible to produce dark cutting beef by depleting the muscles of their extractable reducing sugars.

It was found that the oxygen uptake capacities of dark muscles were greater than the light colored muscles, demonstrating a correlation between the water extractable reducing sugars and the color of the muscle.

A test made on 122 4-H Club steers from the 1941 International Livestock Exposition was designed to determine the

Summary of Carcass-yields.*

Chicago Style of Cutting				New York Style of Cutting			
Cut	Choice Grade	Good Grade	Commercial Grade	Cut	Choice Grade	Good Grade	Commercial Grade
	%	%	%		%	%	%
Hind quarter—1 rib				Hind quarter—1 rib			
Trimmed retail cuts	31 28	33 90	36 30	Trimmed retail cuts	29 08	31 55	34 25
Lean trimmings	1 72	1 75	2 20	Lean trimmings	1 34	1 35	1 70
Stew meat and kidney	2 35	2 25	2 50	Stew meat and kidney	3 16	3 20	3 20
Suet cod and shop fat	9 00	6 25	2 80	Suet cod and shop fat	9 02	6 00	2 85
Waste and shrinkage	3 65	3 85	4 20	Waste and shrinkage	5 40	5 90	6 00
Total	48 00	48 00	48 00	Total	48 00	48 00	48 00
Fore quarter—12 ribs				Fore quarter—12 ribs			
Trimmed retail cuts	36 80	36 60	36 34	Trimmed retail cuts	35 90	35 60	34 65
Lean trimmings	2 45	2 10	1 55	Lean trimmings	2 96	2 60	2 05
Stew meat	6 00	6 15	6 75	Stew meat	5 89	6 00	7 30
Shop fat	1 25	75	60	Shop fat	1 54	80	55
Waste and shrinkage	5 50	6 40	6 76	Waste and shrinkage	5 71	7 00	7 45
Total	52 00	52 00	52 00	Total	52 00	52 00	52 00
Carcass				Carcass			
Trimmed retail cuts	68 08	70 50	72 64	Trimmed retail cuts	64 98	67 15	68 90
Lean trimmings	4 17	3 85	3 75	Lean trimmings	4 30	3 95	3 75
Stew meat and kidney	8 35	8 40	9 25	Stew meat and kidney	9 05	9 20	10 50
Suet cod and shop fat	10 25	7 00	3 40	Suet cod and shop fat	10 56	6 80	3 40
Waste and shrinkage	9 15	10 25	10 96	Waste and shrinkage	11 11	12 90	13 45
Total	100 00	100 00	100 00	Total	100 00	100 00	100 00

*Courtesy U S D A

Retail Cuts in Hind Quarter (Chicago Style).*

Cut	Prime	Choice	Good	Commercial	Utility
	%	%	%	%	%
Ground beef from hind shank	3 9	3 6	4 3	4 1	4 5
Heel of round	4 5	4 5	4 8	5 6	5 8
Round steaks	21 6	21 7	26 2	27 2	28 3
Rump (knuckle out)	8 6	8 7	8 8	8 2	8 5
Wedge and round bone sirloin	8 4	8 5	9 9	9 5	9 2
Double bone sirloin	5 7	5 8	6 3	6 4	7 3
Hip bone sirloin	3 7	3 7	3 6	3 7	3 7
Porterhouse steaks	5 9	6 0	6 9	6 2	6 0
T-bone steaks	7 2	7 2	6 9	6 6	6 0
Club steaks	2 2	2 3	2 1	1 6	1 4
Ground beef from flank	4 2	4 0	3 7	3 3	3 0
Total	75 9	76 0	83 5	82 4	83 7
Waste	24 1	21 0	16 5	17 6	16 3

*Courtesy University of Illinois

Approximate Percentages of Wholesale and Trimmed Retail Cuts in a Beef Carcass According to Grade and Style of Cutting.

Chicago Style of Cutting

Cut	Choice Grade	Good Grade	Commercial Grade
	%	%	%
Porterhouse steak	6.40	6.75	7.10
Sirloin steak	7.85	8 00	8 40
Lean trimmings	.60	.75	1.25
Shop fat, mostly	2.65	1.50	.25
Total loin	17.50	17.00	17.00
Kidney	.25	.30	.40
Suet	3.75	3 20	2.10
Total kidney and suet	4 00	3.50	2 50
Round steak	11.00	12.50	13.20
Heel of round	2.55	3.00	3.60
Boneless rump	2 80	3.00	3.40
Lean trimmings	.80	.65	.50
Stew meat	1 20	1.00	.60
Waste—mostly bone	3 65	3 85	4.20
Total round	22 00	24 00	25 50
Flank steak	.68	.65	.60
Lean trimmings	.32	.35	.45
Stew meat	.90	.95	1 50
Cod and shop fat	2 60	1.55	45
Total flank	4 50	3 50	3.00
Total hind quarter 1 rib	48 00	48 00	48 00
Rib—1st 5 ribs	5 90	5 75	5 50
Blade rib—2 ribs	3.40	3.25	3.10
Waste—bone and fat	.70	.50	.40
Total rib	10 00	9 50	9 00
Chuck, round bone	5 00	5.10	5 25
Chuck, rib cut	10 25	10 50	10 94
Lean trimmings	.95	.85	.70
Stew meat	6 00	6 15	6 75
Waste—mostly bone	4 80	5 90	6 36
Total chuck and shank	27.00	28.50	30 00
Plate or navel	7 00	7 00	6 90
Brisket, bone in	5 25	5 00	4.65
Lean trimmings	1 50	1.25	.85
Shop fat	1 25	75	.60
Total plate and brisket	15 00	14 00	13 00
Total fore quarter—12 ribs	52.00	52.00	52.00

New York Style of Cutting

Cut	Choice Grade	Good Grade	Commercial Grade
	%	%	%
Porterhouse steak	6.50	6.80	7.00
Sirloin steak	6.75	7.25	7.50
Lean trimmings	.58	.70	1.20
Shop fat, mostly	2 67	1.25	.30
Total loin	15.50	16.00	16.00
Kidney	.25	.30	.40
Suet	3 75	3 20	2.10
Total kidney and suet	4.00	3.50	2.50
Top round	3.35	3.75	4.25
Bottom round	4 25	4.85	5 85
Top sirloin	4 50	4 80	5.25
Boneless rump	3 05	3.45	3 80
Lean trimmings	.63	.50	.25
Stew meat	1.82	1.75	1.10
Waste—mostly bone	5.40	5 90	6.00
Total round	23 00	25 00	26.50
Flank steak	.68	.65	.60
Lean trimmings	.13	.15	.25
Stew meat	1.09	1.15	1.70
Cod and shop fat	2.60	1.55	.45
Total flank	4.50	3 50	3.00
Total hind quarter 1 rib	48 00	49.00	48 00
Rib—1st 6 ribs	6.40	6 25	6.05
Blade rib—2 ribs	2 85	2.65	2 50
Waste—bone and fat	75	.60	45
Total rib	10 00	9 50	9 00
Cross rib	4 60	4 75	4 80
Chuck steak or roast	7.10	7.95	8 10
Lean trimmings	1.45	1 40	1.30
Stew meat	5.89	6 00	7.30
Waste—mostly bone	4 96	6 40	7.00
Total chuck and shank	24 00	26.50	28.50
Navel	6.10	5 75	5 45
Brisket, bone in	5 25	5 00	4.75
Corner piece	2 00	1.80	1.65
Thick plate	1 60	1.45	1.35
Lean trimmings	1.51	1.20	.75
Shop fat	1.54	.80	.55
Total plate and brisket	18 00	16.00	14.50
Total fore quarter—12 ribs	52.00	52 00	52 00

XVII.

THE VEAL CARCASS AND ITS CUTS

Veal has very little protective fat covering, is high in moisture, and does not lend itself to aging or ripening. It is necessary, therefore, to move veal into retail channels without delay.

Beef and veal cuts, aside from their water, fat, and ash content, differ mainly in size and terminology. Veal is tender by nature, because of its age. Calf carcasses fall between the veal and beef stage and are usually considered inferior to both, grade for grade. This is due to the fact that the flesh of calf carcasses has developed beef characteristics without the accompanying fat covering and marbling that enhance beef qualities.

CLASSES AND GRADES OF VEAL CARCASSES

Steer
Heifer
Bull

- Lightweight—Prime, Choice, Good, Standard, Utility, Cull. 70 pounds down
- Mediumweight—Prime, Choice, Good, Standard, Utility. 71 to 110 pounds.
- Heavyweight—Prime, Choice, Good, Standard. 111 pounds up.

CLASSES AND GRADES OF CALF CARCASSES

Steer
Heifer
Bull

- Lightweight—Prime, Choice, Good, Standard, Utility, Cull. 110 pounds down.
- Mediumweight—Prime, Choice, Good, Standard, Utility, Cull. 111 to 165 pounds.
- Heavyweight—Prime, Choice, Good, Standard, Utility. 166 pounds up.

Wholesale Cuts

The size of the carcass will determine the method of cutting. The larger calf carcasses are generally halved and then

determine: (1) the per cent of bone........%; (2) the per cent of fat........%; (3) per cent fillet........%; (4) per cent loin strip........%; (5) per cent sirloin........%; (6) per cent salable meat........%. What must be charged per pound to realize 25 per cent on the gross sales for (1) the loin strip and sirloin, and (2) the fillet, after allowing 3 cents per pound for the shop fat?

Effect of Grade Upon Retail Cutting Percentages.

Retail Cuts in a Carcass (Cut Chicago Style)

Cut	Prime	Choice	Good	Commercial	Utility
	%	%	%	%	%
Ground beef from hind shank...	1.9	1.8	2.0	2.0	2.0
Heel of round..................	2.2	2.2	2.3	2.7	2.8
Round steaks...................	10.5	10.5	12.5	13.2	13.6
Rump (knuckle out).............	4.2	4.2	4.2	4.0	4.1
Wedge and round bone steaks...	4.1	4.1	4.4	4.6	4.4
Double bone steaks.............	2.8	2.8	3.0	3.1	3.5
Hip bone steaks................	1.8	1.8	1.7	1.8	1.8
Porterhouse steaks.............	2.9	2.9	3.3	3.0	2.9
T-bone steaks..................	3.5	3.5	3.3	3.2	2.9
Club steaks....................	1.1	1.1	1.0	.8	.7
Ground beef from flank.........	2.0	1.9	1.8	1.7	2.0
Brisket........................	4.9	4 2	4.2	3.8	4.2
Short plate....................	8.8	7.9	7.3	6.9	6.6
11-12th Ribs...................	2.2	2.2	2.1	2.2	1.8
9-10th Ribs....................	2.6	2.6	2.6	2.6	2.2
7-8th Ribs.....................	3.2	3.2	2.8	2.8	2.7
6th Rib........................	2.0	2.0	1.6	1.8	1.9
5th Chuck rib..................	2.2	2.2	2.1	2.1	2.2
3-4th Chuck ribs...............	4.9	4.4	5.2	5 2	4.7
1-2nd Chuck ribs...............	4.4	4.4	5.0	5.2	5.0
Neck (boned)...................	7.6	7.4	8.3	8.0	8.2
Ground beef from fore shanks....	1.7	1.8	1.8	2.1	2.2
Arm............................	4 9	4.9	5 4	5.7	5.6
Total..........................	86.4	84.0	87.9	88.5	88.0

*Courtesy, University of Illinois.

Retail Cuts

The method of cutting veal follows the same pattern that is employed in cutting beef (Chicago style), with a few exceptions. One of these exceptions is where the boned neck and brisket are rolled in with the shoulder of light veal carcasses in making the rolled shoulder. Another variation is where the National style of cutting a hind quarter of beef is followed to give a higher proportion of veal round steak.

The Veal Shoulder. The term veal precedes the name of the cut to differentiate it from beef, lamb, and pork. The term "veal chuck" is just as appropriate as the term "veal shoulder." Small veal shoulders are often boned and rolled, using the same method as was followed in boning a shoulder of lamb. The chucks of calf carcasses can be made into top and bottom shoulder rolls which are more nearly the size desired by the trade. In some sections, the shoulder is cut from the carcass between the third and fourth ribs to make a three-rib chuck, while in others it is cut as a four-rib chuck.

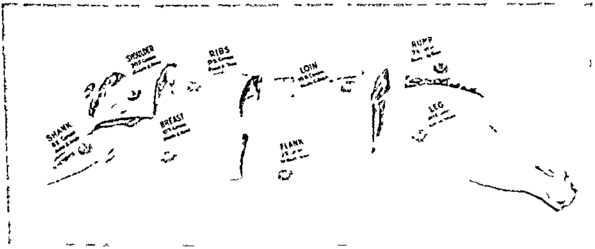
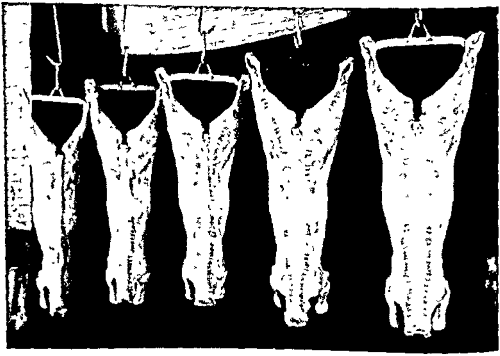


Fig. 17.2—Percentages of wholesale cuts in a side of veal. (Courtesy, Armour & Co.)

Slices that include the fourth, fifth, and sixth ribs are referred to as *blade veal chops.* They are cut parallel with the ribs and represent "chuck steak" in beef. Similar slices including the first, second, and third ribs are termed *blade veal steaks* or *veal chuck steaks.* Cut from the arm, they are called *arm veal steaks* (arm steak in beef). Unscrupulous dealers have been known to misrepresent *arm veal steak* as "veal round steak" (veal cutlets). Large quantities of veal shoulder are used in making *"veal stew"* and *"city chicken."* The latter generally consists of one-inch

quartered, whereas the smaller calf and practically all veal carcasses are cut into fore and hind saddles. A *fore saddle* is the part of the carcass anterior to the twelfth rib or the two unsplit fore quarters. A *hind saddle* consists of the two unsplit hind quarters posterior to the twelfth rib. Other wholesale cuts of veal are *long saddle*—two unsplit hind quarters with loin and nine ribs attached; *shoulders* or *veal chucks*—split or unsplit shoulders of four ribs with briskets and fore shanks attached; *legs*—single or unsplit, cut in front of the hips; *veal backs*—single or unsplit, and cut from the fourth rib to the hip bone (including loin and nine ribs); *rattles*—the unsplit shoulders with breast and shanks attached; and *rib backs*—the unsplit ribs (eight ribs on each side).

A veal carcass is generally sold with the liver and sweetbread attached. The demand for veal liver is so great that retailers invariably demand it. The average liver in a 90 pound veal carcass weighs about 3½ pounds. At $1.00 per pound, it represents a value of $3.50, or approximately 4 cents a pound on the 90-pound carcass.



Cull Standard Good Choice Prime

Fig. 17.1—Six grades of veal carcasses (Utility not shown).

be molded into patties bound by a slice of cured bacon. A mixture of 80% pork and 20% veal makes an excellent sausage. Veal breasts are also boned and made into breast rolls which are boiled and used cold as a jelled cut, or sausage breast rolls—a layer of sausage rolled into the breast, or a pocket is made between the ribs and the meat to hold stuffing. A four-rib shoulder is 22% to 24% of the weight of the carcass. The neck, shank and breast represent another 16%-18%.

Ribs. A cut which is the result of chopping with a cleaver is termed a *chop.* Only soft bones and the solid bones of young animals are adapted to the use of the cleaver. Round or hollow bones and the bones of older animals will splinter and should be sawed. The ribs of veal when cut into slices for braising are called *veal rib chops.* Removing the meat from the end of the rib for a distance of 1½ to 2 inches is called *frenching.* When a loin or rib chop is cut from ¾ to 1 inch thick and a pocket is made in the eye muscle, the chop is called a *bird* or a *chop for stuffing.* This practice is followed in both veal and pork. If the opening for the pocket is made on the flank side of the eye muscle, the stuffing can be inserted and will remain so without pinning the opening. On a rib chop, the opening can be made from the inside of the rib.

Ribs from light veal carcasses can be made into *veal crown roasts* (see lamb for details). Ribs from heavy veal carcasses can be prepared for roasts either as *standing ribs* (bone in) or as *rolled veal rib* (boneless). An eight-rib saddle represents 7½% to 8% of the weight of the carcass.

Loin. Here the terminology between beef and veal differs considerably. The steaks cut from the large or rump end of the loin are called *sirloin veal steaks* or *sirloin veal cutlets* (sirloin steak in beef). When used as a roast this is termed a *sirloin veal roast.* From the last rib to the hip bone (short loin in beef) is the region of the lumbar vertebrae from which *loin veal chops* (Porterhouse and T-bone steak in beef) are cut. If the chop includes a slice of kidney imbedded in the kidney fat, the cut is known as a *kidney veal chop.* The veal fillet or tenderloin which lies on the under side of the vertebrae is seldom removed as a separate cut. The loin is more suitable as a roast if it is boned and rolled, preferably taking the loin saddle which includes both sides. The loin of veal with kidney, suet, and flank represents about 17% of the carcass weight.

squares of veal cut one-half inch thick and placed on a five-inch skewer with alternate layers of pork.

Veal shanks and breasts usually are boned, and the meat diced or ground. *Ground veal* is commonly used in combination with pork for veal loaf (20% pork), and for mock chicken. When used for the latter, the mixture should be seasoned by the retailer before it is molded and placed on skewers. The seasoning for veal loaf is added by the housewife. The same combination can also

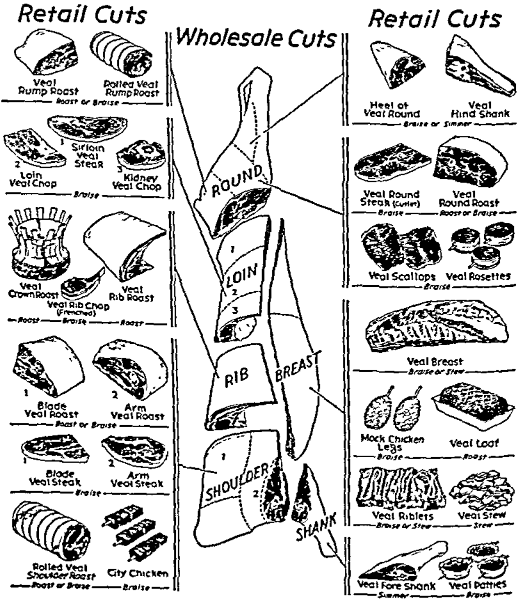


Fig. 17.3—

XVIII.

THE SHEEP CARCASS

CLASS AND GRADE

Lamb
- Hothouse—Prime (extra fancy), choice (fancy), good, fair, cull.[1]
- Spring—Prime, choice, good, utility, cull.
- Lamb—Prime, choice, good, utility, cull.

Yearling—Prime, choice, good, utility, cull.

Mutton
- Wethers—Choice, good, utility, cull.
- Ewes—Choice, good, utility, cull.
- Bucks—Choice, good, utility, cull.

[1]New York City grades for Hothouse Lambs.

IDENTIFICATION

Hothouse lambs, dropped from September through February, are marketed at a hog-dressed weight of 20 to 40 pounds, and are most popular during the Christmas and Easter holiday seasons. It is customary to dress and ship them with the pelts on (hog-dressed) to hold the bloom and protect the carcasses from excessive shrinkage. Carcasses with the "pelt-off" should weigh from 18 to 30 pounds, or give a carcass yield of 48% to 55%. The average yield for the "pelt-on" lamb is 70%. Hothouse lamb carcasses are recognized by their small size, the very pale outside muscle covering, and the very red (bloody) and deep ridged break joint. The market for these lambs, although limited, is steadily growing. They furnish a very tender meat that is delicate in flavor and free from any mutton taste.

Spring lambs appear on the market in April through August, and originate in California and Arizona, followed by Texas, Tennessee, and Kentucky, where climatic conditions are favorable

Leg or Round and Rump. The greatest demand is for *veal round steak* or *veal cutlet.* Considering that the leg with the rump off represents 27% of the carcass weight and that only 50% to 60% of this can be cut into cutlets (round steak in beef), it must be evident that this cut is the most expensive in a veal carcass. The veal round is removed in the same manner as a beef round in the National style of cutting. Cutlets may be made in thicknesses of ½ to 1½ inches, depending upon the use to which they are put. A cutlet for breading is cut ½ inch thick unless the customer specifies otherwise. The first three to four slices should be priced higher than the remainder of the cuts. Slicing ceases when the stifle joint (shank knuckle bone) is reached. The meaty part on the back of the shank can be cut for a small *heel of veal round* pot roast.

The rump is suitable as a roast with bone in or boned and rolled. It is often used in making "city chicken."

formation, thicker fleshing, heavier bone, and a smaller bung and pelvic cavity.

Buck mutton carcasses are from uncastrated male sheep and are recognized by their large size, heavy shoulders, coarse necks, large bones, and the absence of cod fat.

Ewe mutton carcasses have larger abdominal cavities, larger bungs, wider pelvic arches with parts of the udder present, and more slender necks and shanks than wethers.

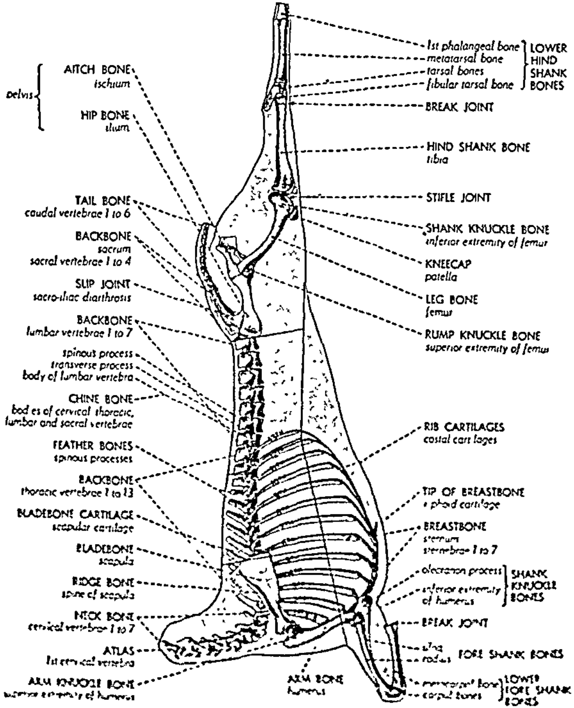


Fig. 18.1—

for early lambing. Sections of Idaho, Washington, and Oregon are heavy fat lamb shipping centers from June to September.

Spring lamb carcasses average somewhat lighter in weight and show less age than the ordinary run of lamb carcasses. They have the characteristic four well defined ridges on the leg joint (break or lamb joint), the thin outside muscle covering the flank and rib is pale pink in color, and the break joint is red and porous. The younger the lamb, the lighter pink is the color of the flesh.

Lamb carcasses are most common on our markets during the fall and winter season due to the fact that the natural lambing season for the greater part of the United States extends from February through May. The most desirable weight carcass range is from 30 to 45 pounds, 35 pounds being the optimum weight. Probably the most important reason for this weight is because the greatest demand from consumers is for legs weighing from 4 to 6 pounds. Approximately 30% of a good lamb carcass is in the leg; in the case of a 35-pound carcass, 10½ pounds, or 5¼ pounds to the individual untrimmed leg.

Yearling (mutton) carcasses are distinguished from lamb by their larger size, wider abdominal cavity (they tend to be slightly pot-bellied), the whiter color of the break joint, and the darker red color of the outside muscle covering the flank and ribs. They have a rather wide range in weight, depending upon the breed, but the most desirable weight is around 50 pounds. It is not unusual to find 70- to 80-pound yearling carcasses in well finished stock. Carcasses from yearlings that have been fitted for show carry an excessive amount of internal and external fat and the fore saddle is very difficult to market. It is not uncommon for a boned shoulder of prime yearling to show a 40% waste.

Mutton carcasses are from sheep 20 months or more of age and are identified by the presence of the spool or mutton joint (ankle). This joint is hard, smooth, and white with two prominent ridges, and is in no way similar to the lamb or break joint situated about three-eighths of an inch higher up.

Sex is an important distinction in this class of carcasses since it affects the yield and quality of the carcass. Wether carcasses are superior to ewe carcasses, with buck carcasses ranking inferior to both.

Wether carcasses, both lamb and mutton, are distinguishable from ewe carcasses by the presence of cod fat, a more even con-

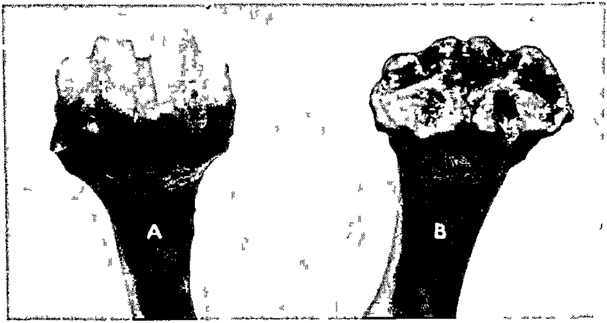


Fig 18.3—(A) Spool or mutton joint. (B) A lamb or break joint

THE LAMB CARCASS AND ITS CUTS

Lamb and mutton carcasses of the better grades have a covering of hard, white fat that protects them from shrinkage and bacterial decomposition, and makes them adaptable to aging or ripening. Therefore, unlike veal and pork, which must be moved fresh, lamb and mutton can be held for several weeks.

Wholesale Cuts

A carcass may be divided as follows: (1) halved, in which case it is split through the center of the backbone; (2) divided into *fore* and *hind saddle* by cutting in back and close to the thirteenth rib; (3) cut into a *long saddle* and *chucks* by making the cut between the fourth and fifth ribs or fifth and sixth ribs; (4) dividing the carcass into *legs* (cut across the back close to the hip bone); *loins* (hip bone to last rib); *rib racks or hotel racks*—(eight ribs); *chucks*—(first five ribs); or (5) by dividing the carcass into *legs, back* (loin and eight ribs), and *chucks* (five ribs).

The breast is left on the above wholesale cuts unless the back is cut out of the fore saddle, leaving the breast attached to the chucks, making a cut known as the *rattle* or *triangle*.

Lamb livers may or may not accompany lamb carcasses.

Retail Cuts

Lamb is cut very much the same in all parts of the United States with the exception that certain cuts are far more numer-

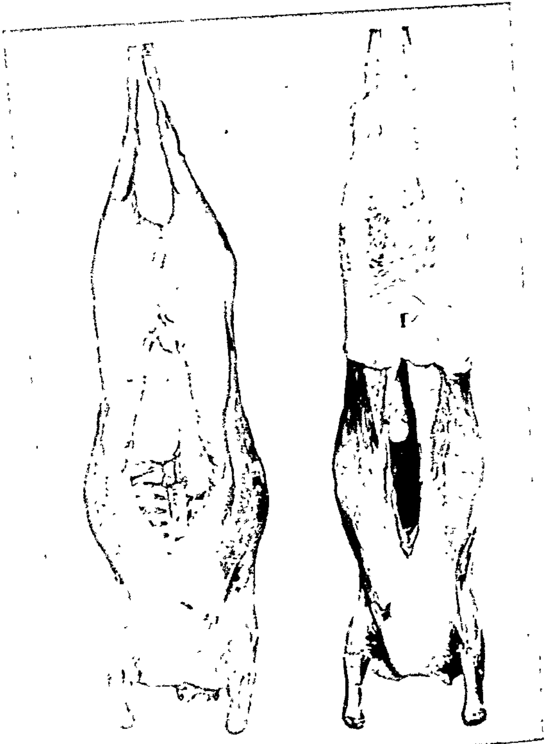


Fig. 18.2—A mutton carcass (left) showing the large abdominal cavity. A lamb carcass (right) draped with the web fat, leaving a trim mid-section.

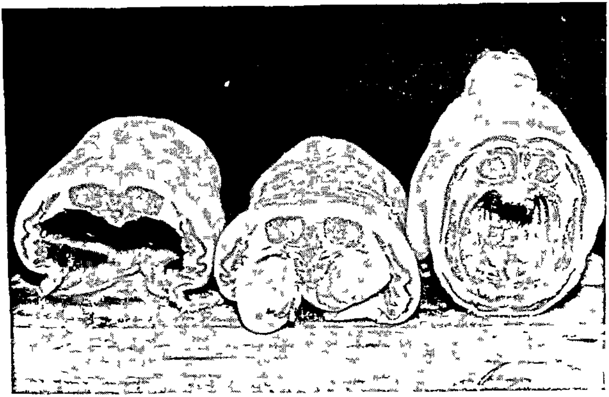


Fig. 18 5—A wasty, overfat lamb shoulder.

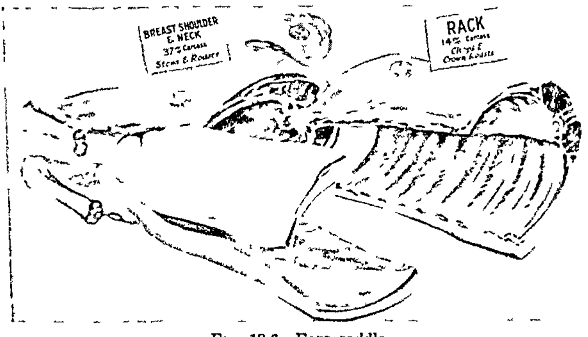


Fig. 18 6—Fore saddle.

The Lamb Shoulder

Five ribs are standard for a chuck or shoulder cut, although many retailers cut four ribs to the chuck. This leaves an extra blade rib on the back. Lamb shoulders can be cut into *blade* and *arm chops*. First remove three arm chops from that part of the shoulder containing the humerus (the shank was cut off from

ous in some localities than in others. In one locality, practically all lamb shoulders are either boned and rolled for roasts, or cut into stew, while in another very few lamb shoulders are boned. Philadelphia meat cutters separate lamb shoulders into two parts, (1) the shoulder, and (2) the rack. The shoulder consists of that part from which a mock duck is made. The remainder of the shoulder which they term the rack contains the rib and back bone and is cut up for stew. The shoulder is sold for stewing purposes or is boned and rolled.

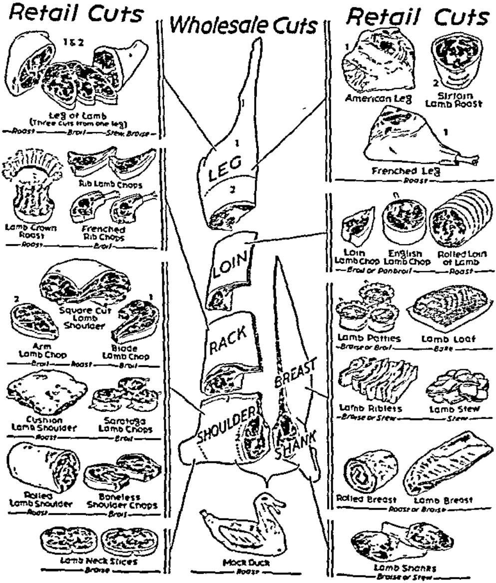


Fig. 18.4—

Fig 18 8—Cuts from a rattle of lamb (A) Rattle of lamb, (B) lifting the shoulder or wing of lamb from which (F) the mock duck is made, (C) making a pocket in the lamb breast for stuffing or by boning out the breast and making (E) a breast or plate roll, (D) neck slices of lamb, (I) the square chuck or shoulder from which may be cut (H) arm shoulder chops and (J) blade shoulder chops, (G) the under cut of a shoulder after the wing is lifted can be boned and rolled and made into (L) saratoga chops, (K) a cushion style shoulder, (N) showing the manner of boning a shoulder of lamb to make a cushion or (M) a rolled shoulder

this end), then cut blade chops from the blade end by cutting parallel with the ribs. On a five-rib chuck there will be five blade chops and two or three arm chops, depending upon the thickness of the slices. This leaves the shoulder joint and the neck, which are cut for stew or boned and ground for making lamb patties.

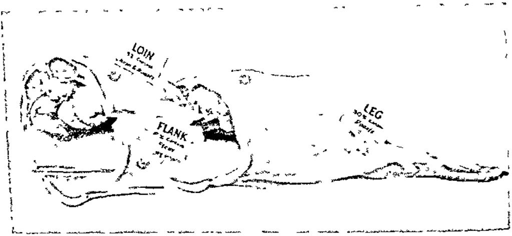


Fig. 18.7—Hind saddle. (Courtesy, Armour & Co.)

A lamb shoulder can be made into a compact *rolled shoulder* for roasting by the following operations. Lift the ribs and backbone from the inside of the shoulder and neck (the neck is left on). With the outside of the shoulder face down on the block, cut close to the inside surface of the blade bone and continue the cut down to the arm bone (the humerus where the shank was removed). Do not extend the cut through the top of the shoulder unless it is a large one that you wish to divide into two pieces (top and bottom) to make separate rolls. The opening takes the form of a triangular pocket and by first freeing the humerus and cutting around the joint, the shoulder can be turned practically inside out to permit the severing of the muscle on the ridge side or outside of the blade bone. Do not attempt to cut over the ridge bone but grasp the blade bone at the shoulder joint and pull it out. Place the boned shoulder back in its natural position (the same as it was before the bone was removed) with the inside up and remove the bloody shoulder vein and other excess fat. Remove the neck and trim off the excess fat or any blood. The removal of the neck will expose the pre-scapular fat gland which is a large pocket of fat containing a lymph gland. It is very important that this fat be removed. The inclusion of the

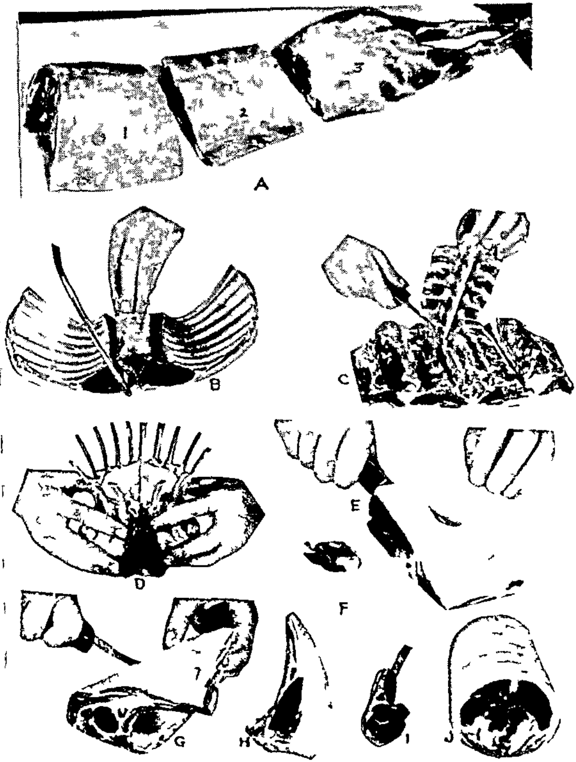


Fig 18 9—Cuts from the long saddle of lamb (A) A long saddle, 1 rib rack 2 loin, 3 legs, (B) sawing ribs from each side of vertebrae of a rib rack in order to remove the back bone A strip of meat is then cut from the end of the ribs and the rack bent into shape to form (D) the crown roast, (C) boning a loin to make (J) a rolled lamb loin or (E) a boneless loin from which boneless loin chops are cut or (F) boneless rolled loin chops that are fastened with a skewer, (G) half a rib rack from which rib chops (H) or frenched chops (I) are cut.

prescapular gland in a rolled shoulder is one of the surest ways to spoil a resale on this cut because the customer usually objects to fat. It is always preferable to run a higher waste on lamb shoulders and assure customers of a meaty product than it is to shade the price. A customer feels that fat is expensive at any price.

With the bone out and the shoulder trimmed, the next step is to place the piece of boned neck in the blade end of the shoulder to fill in the cavity made by the removal of the blade bone. Do not place it in any old way, but have the thick, meaty cut surface pointing out to blend in with the rest of the meat. The shoulder is rolled from the top toward the arm side. Take a beef needle and insert the string through the blade end to secure the neck so it will not drop out. Take three more similar stitches to secure the entire shoulder. This method is preferable to tying the string around the entire outer surface of the shoulder. Another type of shoulder roast is made by sewing up the arm end, and leaving a pocket and the opening on the blade end for the insertion of filling. This is termed a *cushion style shoulder* of lamb.

In making neck slices, it is necessary to remove the neck from the carcass before the shoulders are divided. A *double neck slice* is made by sawing through the neck bone but leaving the two slices attached on the bottom and laying them back.

Mock Duck of Lamb is a specialty cut that is suitable for a display cut or for special occasions such as children's or surprise dinner parties. It is made from the wing or the outside half of the shoulder which contains the scapula, humerus, and radius. It is separated from the main body of the carcass by cuttting underneath the shank and following the loose dividing membrane up to the backbone. The blade bone or scapula and humerus are removed but the radius or shank bone and half of the metacarpal are left on, the metacarpal bone forming the bill of the duck. The boneless part of the wing is folded and sewed in the shape of a duck's body and the shank or neck is drawn up and secured by stitching it to the body. A tail is made from the cartilaginous tip of the blade bone and the wings are outlined in the body with a knife. A split cranberry, secured to either side of the head by small pins, is used for the eyes. The time involved in making a mock duck is about the same as in making a rolled shoulder of lamb.

Fig 18 10—The leg of lamb (A) Removing the loin end from the legs to reduce the size of the legs; (B) boning the loin end of the leg; (E) the completed sirloin roll; (C) circling the knife around the leg about two inches above the break joint preparatory to making a frenched leg of lamb, (D) a frenched leg of lamb; (F) removing leg bone at stifle or knuckle joint to make the (H) American style leg of lamb in which the shank meat is tucked into a pocket made under the vellum on the inside of the leg; (G) boneless sirloin chop cut from one side of (B).

Saratoga Chops are made from the large shoulder muscle taken from the rib half that is left when making a mock duck. It is boned out along with some of the thin muscle down over the rib, rolled, and skewered so that in slicing, each slice contains and is held together by a skewer.

Lamb Breast is either boned and rolled for a roast, for boneless lamb stew, or ground for lamb patties. A popular method of using lamb breast in some localities is to cut the breast into two or three strips and then cut the strips into individual ribs called *riblets.* A pocket may be made in a lamb breast by cutting the thin, lean covering from the ribs, leaving the flesh attached at the ends and along one side. This is suitable for stuffing.

Lamb Shanks or *Trotters* are suitable for braising, after which they can be breaded and served as *drumsticks.*

Lamb Patties are ground lamb encircled with a strip of cured bacon, with the top edge of the bacon cut at quarter inch intervals for a pie crust effect. The ends of the bacon are held together with a toothpick.

Lamb Back

Crown Roast of Lamb is made from the unsplit rib rack. It consists of 14 or 16 ribs and is made by sawing off the ribs on either side of the backbone and boning out the backbone without cutting through to the outside. About 1½ inches of flesh is removed from the ends of the ribs. Roll the cut with the ribs on the outside, bring the ends together, and secure them with two stitches around the ribs at each end. The inside of the roast is filled with ground lamb, and paper frills are placed over the ends of the ribs before serving.

Rib Lamb Chops are cut from the rib rack. In case of a heavy lamb where one rib to a chop would make them too thick for the trade, an occasional chop can be cut between the ribs. Removing the flesh a distance of 1½ to 2 inches from the end of the rib is known as frenching.

Loin Lamb Chops are cut from the loin and have the tenderloin muscle on the under side of the lumbar vertebrae. In light lamb carcasses, it is the practice in some localities to leave the loin unsplit so a double chop can be cut across the loin. This is termed an *English chop.* Another practice in light lamb is to bone the entire unsplit back and make loin and rib rolls, either for small roasts or to be cut into *boneless double loin chops* and *boneless double rib chops.*

Approximate Average Physical Composition of the Primary Cuts from Lamb Carcasses of the Different Market Grades.*

Cuts and Components	Grades of Carcass					
	Prime	Choice	Good	Commercial[1]	Utility[1]	Cull
Number of lambs	6	17	13	4	6	5
	lbs	lbs	lbs	lbs	lbs	lbs
Aver chilled, dressed carcass wt	50.6	43.2	34.5	31.9	21.3	16.6
	%	%	%	%	%	%
Dressed carcass as analyzed						
Separable fat	32.5	29.6	22.5	18.6	16.2	7.1
Separable lean	50.1	50.4	53.8	58.2	55.1	57.8
Edible portion	82.6	80.0	76.3	76.8	71.3	64.9
Bone and ligament	17.4	20.0	23.7	23.2	28.7	35.1
Leg (trimmed)						
Separable fat	20.6	18.9	13.2	12.1	10.3	4.9
Separable lean	65.5	65.1	68.3	71.1	67.9	69.9
Edible portion	86.1	84.0	81.5	83.2	78.2	74.8
Bone	13.9	16.0	18.5	16.8	21.8	25.2
Rib cut (9 ribs)						
Separable fat	38.9	35.0	24.6	19.0	17.2	3.4
Separable lean	43.2	45.2	50.8	55.7	50.4	55.9
Edible portion	82.1	80.2	75.4	74.7	67.6	59.3
Bone and ligament	17.9	19.8	24.6	25.3	32.4	40.7
Shoulder (3 ribs)						
Separable fat	27.0	24.6	20.0	16.0	15.4	8.8
Separable lean	57.0	56.7	58.0	63.8	58.7	60.0
Edible portion	84.0	81.3	78.0	79.8	74.1	68.8
Bone and ligament	16.0	18.7	22.0	20.2	25.9	31.2
Loin						
Separable fat	37.4	33.8	26.3	20.9	18.3	5.0
Separable lean	51.5	52.7	57.5	62.7	61.2	67.1
Edible portion	88.9	86.5	83.8	83.6	79.5	72.1
Bone	11.1	13.5	16.2	16.4	20.5	27.9
Separable fat	26.2	21.7	14.7	13.2	9.5	1.9
Separable lean	45.9	46.7	50.4	56.1	59.0	53.5
Edible portion	72.1	68.4	65.1	69.3	59.5	55.4
Bone and ligament	27.9	31.6	34.9	30.7	40.5	44.6
Breast						
Separable fat	34.4	33.3	27.8	22.5	16.8	6.6
Separable lean	42.4	40.9	41.9	47.6	47.6	47.9
Edible portion	76.8	74.2	69.7	70.1	64.4	54.5
Bone	23.2	25.8	30.3	29.9	35.6	45.5

[1]The grades Commercial and Utility were designated Medium and Common, respectively, prior to October 5 1940 The standard for the grades were not changed but the commercial grade was eliminated effective April 20 1951

*Courtesy, U.S.D.A

Leg

Leg of lamb is made in several styles; (1) the American style which consists of removing the flesh from the tibia which is disjointed at the stifle joint, and then folding the flesh under the vellum or fell and fastening it with a skewer; (2) the frenched style leg where the metatarsal bone is removed at the break joint and two inches of flesh taken off the end of the tibia; (3) a three-quarter boned leg, in which case the tibia is removed as in the American style leg and the pelvis bone is re-

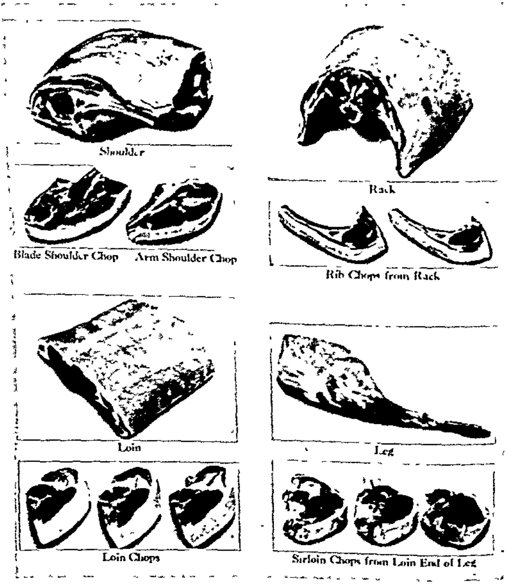


Fig. 18.11—

moved at the hip joint. The flesh is cut off at the stifle and inserted in the cavity made by the removal of the pelvis. The flank is folded over this and secured by three stitches. This makes a very nice appearing cut of uniform thickness and a size that will fit into any roaster. (4) The removal of the femur in addition to the other bones results in a *boneless leg of lamb.*

A leg of lamb may also be cut into steak. In the case of heavy lambs that have legs weighing 8 to 10 pounds or more, the size of the legs can be reduced by cutting off three or four inches of the loin end of the leg before splitting the legs. This cut is boned and rolled and is called a *sirloin lamb roll.*

Chemical Composition and Physiological Full Value of the Primary Cuts and Their Physical Components.*

Grade and Component	Lean of Cut				Fat of Cut				Cut			
	Leg	Loin	Rib	Shoulder	Leg	Loin	Rib	Shoulder	Leg	Loin	Rib	Shoulder
Prime:												
Protein %	19.8	20.0	19.3	18.8	5.8	1.8	3.9	5.1	13.7	12.2	10.0	12.2
Ether extract %	1.9	6.5	9.0	7.7	78.8	82.3	84.4	77.6	21.6	33.7	39.2	26.2
Dry matter %	26.5	28.2	29.8	28.0	81.5	87.0	88.2	83.0	....	....	....	....
Cal. per 100 gm.	128	112	160	152	733	702	776	720	251	355	396	290
Choice:												
Protein %	20.0	20.0	19.1	18.3	7.0	6.5	5.9	6.2	14.7	13.3	11.5	12.1
Ether extract %	5.4	6.2	9.1	8.4	72.6	75.6	77.5	70.4	17.1	25.6	26.7	21.1
Dry matter %	26.9	27.8	29.9	28.2	80.1	82.4	83.6	77.0	....	....	....	....
Cal. per 100 gm.	136	142	165	153	688	708	721	659	217	292	294	216
Good:												
Protein %	20.1	19.9	19.1	18.1	8.3	7.3	6.8	7.2	14.7	13.8	11.6	12.6
Ether extract %	4.8	5.8	7.8	7.6	68.0	73.2	75.8	61.1	11.2	21.7	23.8	18.4
Dry matter %	26.4	27.3	28.7	27.1	76.8	81.0	83.0	72.1	....	....	....	....
Cal. per 100 gm.	129	138	152	147	647	688	709	611	191	253	264	217
Utility:												
Protein %	19.6	19.7	19.3	18.5	8.9	10.7	9.0	7.5	14.1	11.1	11.9	12.7
Ether extract %	1.8	1.8	0.8	6.2	65.9	61.5	67.5	61.2	12.1	11.8	17.6	16.2
Dry matter %	25.2	25.0	27.6	26.2	75.0	73.1	77.0	72.1	....	....	....	....
Cal. per 100 gm.	119	120	110	135	630	599	645	609	169	194	211	199

*Courtesy, University of Illinois.

shoulder of lamb, and fresh or cured pork. It is accomplished by placing the cut (preferably not less than 2½ inches thick) in an open roasting pan with the fat side up so that it will be self-basting. No water is added, neither is a lid used to cover the roast. Smoked pork, fresh beef, veal, and lamb are roasted at an oven temperature of 300° F., whereas fresh pork is roasted at an oven temperature of 350° F.

The use of the slow oven (using low temperatures) in roasting has been found to cut down considerably on the shrinkage incident to high oven temperatures. Basting is eliminated by placing the fat side up, or placing loose fat or bacon strips on the top of lean cuts. Searing does not assist materially in keeping the meat juices from escaping but it gives the meat color and aroma.

Moist Heat Method

Braising. Water, meat or vegetable stock, sour cream or milk may be used to furnish the moisture. This method is employed on the less tender cuts such as the rump of beef (not the rump cut from which steaks are cut in the Philadelphia area); the blade and arm roast of beef or steak from the same cuts; the heel of the round of beef; round and flank steak of beef; the steaks of veal, such as round, sirloin, blade, and arm veal steak; veal loin and rib chops; pork chops (both loin and rib); blade and arm pork steak from the pork shoulder; breast of lamb; neck slices of lamb; and lamb trotters.

The meat to be braised is first seasoned and browned, and dredged with flour (if desired), and the necessary liquid added. The kettle or cooking utensil is covered and the cut is cooked either in the oven or on top of the range at a simmering temperature. This method is commonly called pot roasting.

Cooking in Water. This method of preparing small or large pieces of meat is suitable for such cuts as beef shank (soup bones); beef plate and brisket; veal shank and breast; lamb shank and breast; pork sparerib; and fresh or smoked pork shoulder (butts and Picnics).

In the case of meat that is cut into small pieces for stews, the seasoning is added and the pieces browned (this is optional) in their own or added fat, and then covered with hot water; in some cases tomato juice is added. The kettle is covered and the meat is allowed to cook at a simmering temperature. If vege-

XIX.

PREPARING AND SERVING MEATS

METHODS OF COOKING MEAT

A national committee of investigators has simplified and standardized the cooking of meat into two fundamental methods: (1) cooking with *Dry Heat* where the meat is surrounded by dry air in the oven or under the broiler, a method that is adaptable to the preparation of the more tender cuts, and (2) cooking with *Moist Heat* where the meat is surrounded by hot liquid or steam, a method suitable to the preparation of the less tender cuts of meat. Cuts of veal and pork such as steaks and chops, although considered tender cuts, are best prepared with moist heat.

Dry Heat Method

Broiling. This method is employed with the more tender steaks of beef, steaks and chops of lamb, and cured ham steaks. It consists of a direct exposure of the meat to heat either from above or from both sides. In the latter case, the steak is supported in a vertical position by wire grills with heat on both sides as in a charcoal broiler. The seasoning may be applied before (which is preferable) or after broiling.

Panbroiling. This is a method suitable for the same cuts used for broiling, but it differs in that heat reaches the cuts indirectly. The meat is placed in a heavy iron skillet or on a heavy griddle iron and is browned on both sides. After browning, the temperature is lowered and the cuts may be turned occasionally until done. The fat is poured off as it accumulates.

Roasting. This method is adapted to the preparation of the more tender cuts such as beef ribs, beef sirloin, top round, sirloin tip, veal leg, veal rump, veal loin, veal shoulder, pork loin, pork shoulder, leg of lamb, sirloin lamb roll, loin lamb roll, rolled

have to eat the fat,"—but it is rather difficult to compromise on fat with a lean wallet.

REMINDERS

The guess work in determining the doneness of meat is eliminated by the use of the meat thermometer, a very much appreciated kitchen accessory. It is particularly useful in determining the doneness of roasts. Experiments conducted in commercial and college laboratories on the time required to prepare various meats are based on the use of the meat thermometer and automatically regulated oven and broiler temperatures. This does not mean that the expert cook—mothers for example—with years of cooking experience have any need for these modern gadgets, but beginners must have specific answers and directions. Some of these are as follows:

Bacon is more desirable when pan broiled below its smoke point (290° to 300° F.) in its own grease until crisp, and a light golden brown in color. Draining off the grease as the bacon fries may cause scorching or burning. However, bacon broiled on a rack about 4 inches below the flame retains more of its original thiamine (vitamin B_1).

A temperature of 300°-325° F. is best for deep fat frying.

Do not boil meat but use a simmering temperature of 185°-205° F. This includes soup making.

A constant oven temperature of 300° F. for roasts of beef, veal, and lamb, and 350° F. for pork, produces more tender and palatable roasts than higher temperatures.

High oven temperatures affect the cost of the meat by increasing fuel consumption and shrinkage in meat poundage. It's very disheartening to open an oven and find the roast charred and about half its original size.

The shape being the same, the larger cut will require a longer total cooking period but fewer minutes per pound.

Meat cooked without undue shrinkage is juicier and higher flavored. Burned meat results in damaged proteins.

Searing meat does not hold in the juices but is used by many to brown the outside of a roast and develop aroma.

The water soluble B vitamins leak into the drippings. Low temperature cooking will result in more of these vitamins remaining in the meat. Gravy should never be discarded. It is the valuable by-product in meat cookery.

tables are to be added, do this just long enough before the meat is tender so that it will not be overdone. The liquid is thickened so that it may be served separately or with the stew.

THE COMPOSITION OF COOKED MEAT

It has been common knowledge that the major loss in weight in cooked meat is due to the loss in moisture evaporated by the heat. This change in weight alters the percentage of protein, fat, and ash of the cooked meat as compared to the fresh meat. Another weight loss is that of the melted fat. This will be affected in large part by the degree of doneness.

The work of Leverton and Odell of Oklahoma in 1956-1958 showed that evaporation loss during cooking varied from 1.5% to 54.5% with an average range between 15% to 35%. The cooked lean meat without any marbling and with all separable fat removed contained from 5% to 10% fat and up to 35% protein.

Weighted Values for Nutritive Value of Cooked Cuts of Beef, Veal, Lamb, and Pork.[1]

Type of Meat	No. Cuts	Energy	Protein	Fat	Moisture
		calories	gm.	gm.	gm.
Beef-lean	18	209	32.5	7.8	58.2
-lean-plus-marble	22	266	28.9	15.0	55.0
Veal-lean	8	192	33.6	5.3	59.2
Lamb-lean	5	188	28.6	7.3	62.0
-lean-plus-marble	6	258	26 6	16.1	56.7
Pork-lean	8	194	30.7	7.0	60.6
-lean-plus-marble	8	253	27.6	15.0	55.2

[1]Values were based on 100 grams of cooked meat.

Considering that the protein content of fresh beef, lamb, and veal averages 19%-22% and pork 15%-17%, it is interesting to note the relatively high protein content of the cooked meats. Note also that the lean portion or the lean-plus-marble portion of cooked pork did not contain any more fat than the beef or lamb.

The ratio of fat to lean is more important to people of moderate means than to those with higher incomes. It is easy to say, "You must have fat to have quality in meat," and "You don't

Time Table for Cooking Meats.*

Cut	Broiled		Roasted 300° F. Oven		Roasted 350° F. Oven		Braised	Cooked in Water
	Rare	Med.	Thermometer Reading	Mins. Per Lb.	Thermometer Reading	Mins. Per Lb.		
BEEF								
Standing Ribs								
Rare			140°F	18-20				
Medium			160°F	22-25				
Well done			170°F	27-30				
Rolled ribs			Same as above	Add 10-15				
Chuck Ribs			150°-170°F	25-30				
Rump			150°-170°F	25-30				
Tenderloin			140°-170°F	20-25				
Steaks								
1 in	15-20	20-30						
1½ in	25-35	35-50						
2 in	30-40	50-70						
Swiss Steak							2-3 hrs	
Short Ribs							1½ 2 hrs	
Stew								2-3 hrs
Corned Beef								4 hrs
Fresh Beef								3-4 hrs
Pot Roasts								
Chuck							3-4 hrs	
Rump							3-4 hrs	
PORK								
Fresh	Fresh Pork is never broiled							
Loin					180°F	35-45		
Shoulder					185°F	35-45		
Butt					185°F	40-45		
Ham					185°F	30-35		
Chops							45-60 min	
Steaks							45-60 min	
Spare ribs							1½ hr	30 min
SMOKED HAM								
Large					160°-170°F	15-20		
Small					160°-170°F	20-25		
Half					160°-170°F	25-30		
Ham Slice								
½ in		15-20						
1 in		20-30						
Picnic					170°F	35		
Bacon		4-5						

(Continued on next page)

Maintaining a constant broiler temperature of 390°-400° F. gives the best broiling results.

Boneless or rolled cuts require from 5 to 10 minutes more time per pound to cook than unboned cuts.

Roasts with long bones require less time than thick, chunky cuts.

Retention of B-vitamins in properly roasted meat averages: thiamin—70%, riboflavin and niacin—90%.

Meat that is cooked without undue shrinkage has higher nutritional value.

The tenderness of steaks decreases with the decrease in carcass grade.

Cooking time can be decreased by the use of metal skewers and by unventilated ovens.

Small roasts, under 2 pounds and less than 2 inches thick, are rather uneconomical. They also tax the patience of the retailer. Many fine dishes can be made from left overs. And how about those handy cold cuts of roast beef, pork, lamb, and veal for sandwiches or midnight snacks?

Don't increase the cost of hamburg by buying expensive cuts such as steak for grinding. The cheapest cut, mixed with sufficient beef suet or fat back, will be as delicious and even more nutritious. This applies to personal marketing and not telephone-order buying.

When buying meat for making a meat loaf, buy one fourth of a pound of fresh pork for each pound of beef and have them ground together. Pork shoulder and boneless beef shank, neck, or plate are good buys.

Meat should be removed from its package upon delivery, placed in a closed ceramic receptacle or wrapped in waxed paper and placed under refrigeration. Aged meats left to lie in a warm kitchen for half a day may develop an odor that is offensive.

A good kitchen scale makes an efficient short weight detective.

More courteous and diligent treatment is given to customers who pay their bills regularly.

If lard is not held under refrigeration, place it in a fruit jar and keep the jar sealed.

A dark color in meat does not necessarily mean that it is spoiled or of poor quality. (See Chapter XIII.)

Frozen meat that has been thawed need not be used immediately as is commonly recommended, because repeated tests have shown that such meat will keep as long as fresh meat.

Refreezing meat does not materially affect its quality. Tests in which beef, properly wrapped in a good grade of locker paper, film, or aluminum foil, was thawed in the unopened package until it became warm, was refrozen, and later was rethawed and held in that condition in a 38° F. household refrigerator for an additional week, was still in excellent condition when cooked. This does not mean that one should become careless, but it also suggests that one need not become panicky about using all the meat in a package that has been thawed if it is more than is needed for that meal. Rewrap it, refreeze it, and use it at another time.

It is unnecessary to freeze the wrapped meat at —10° F. before placing it in zero storage. In other words, the rate at which meat is frozen does not materially affect its quality as long as that temperature is zero or below.

Every time frozen meat is thawed it will lose some of the meat juices. If the position of the thawed meat package is reversed (turned over) when replaced in the zero compartment for refreezing, these juices will be reabsorbed to a large extent.

Frozen steaks should be thawed prior to broiling unless one desires a raw center. To cook the center medium to well-done will cause an overdone steak on the outside unless it is placed farther from the heat element.

Freezing has a tenderizing effect on meat in that it ruptures the less tender cell walls.

Zero temperatures materially depress the proteolitic enzyme action that breaks down connective tissue into gelatin during the aging process, but tests show that the same tenderness secured by aging beef two weeks will result by holding it at zero or below for 6 months.

The so-called freezer burn on meats is caused by a considerable dehydration (moisture loss) of the meats or parts thereof, due to a poor grade of paper, improper wrapping, or holes in the paper. The condition is not serious and can be ignored since these areas become normal in the cooking process. In badly dehydrated meat, water added in the cooking to replace that which was lost will help, but the meat will lose considerable flavor and tend to be tough and stringy.

Time Table for Cooking Meats (Continued).

Cut	Broiled	Roasted at 300°F.		Braised	Cooked in Water
		Thermometer Reading	Mins. Per Lb.		
LAMB					
Leg		170°-180°F.	30–35		
Shoulder					
Whole		175°-180°F.	30–35		
Rolled		175°-180°F.	40–45		
Cushion		175°-180°F.	30–35		
Chops					
1 inch	12 min.				
1½ inch	18 min.				
2 inches	22 min.				
Lamb patties	15–18				
Breast					
Stuffed				1½-2 hrs.	
Rolled				1½-2 hrs.	
Neck Slices				1 hour	
Shanks				1½ hour	
Stew					1½-2 hrs.
VEAL	Veal is seldom broiled				
Leg		170°F.	25		
Loin		170°F.	30–35		
Rack		170°F.	30–35		
Shoulder					
Whole		170°F.	25		
Rolled		170°F.	40–45		
Breast					
Stuffed			40–45	1½-2 hrs.	
Rolled			40–45	1½-2 hrs.	
Birds				45–60 min.	
Chops				45–60 min.	
Steak				45–60 min.	
Stew					2-2½ hrs.

Note: Pressure cooking has been found to reduce the biological value of meat proteins.
*Courtesy, National Livestock and Meat Board.

Monosodium Glutamate, the vegetable protein derivative, accentuates the natural flavor of food and has been regarded as essential as table salt by the Chinese and Japanese.

Much of the fate of a cut of meat rests in the cooking.

HANDLING FROZEN MEAT IN THE HOME

Below zero temperatures (the lower the better) are best for holding frozen meat.

scrub the bird lightly with a stiff bristled brush and warm water. Flush the inside cavity, drain, and wipe dry. Remove the oil sac on top of the tail and disjoint the neck near the shoulder (see Chapter XI on Dressing a Fowl).

Sprinkle the inside of the bird with salt. Place a stuffing in the body cavity of the bird (avoid packing) and draw the ends of the drum sticks down against the opening, using a cord that laps over the back of the tail and the ends of the legs. Ducks, pheasants, and guinea fowl will require stitching to close the opening but the legs of all fowl must be tied close to the body to avoid over-cooking and drying. The loose skin at the base of the neck may be filled with the stuffing and the end tied with a cord. Birds may be stuffed the previous day but the flesh will absorb the flavor of the stuffing and this is considered objectionable by some.

Fold the wing tips back on the wings. Rub the breast and legs with butter or margarine and sprinkle with salt, preferably celery salt. Dust lightly with flour, if desired. Ducks and geese need no added fat.

Roasting

The procedure will vary with the age of the bird. Old birds should be steamed or braised for 1½ to 2 hours. This is done by placing the bird breast up on the rack in the roaster. Cover the bottom of the roaster with hot water, place lid on roaster and braise in oven temperature of 250°-275° F. It may be necessary to add water several times during the braising process. Some prefer to braise the stuffed bird, and others add the stuffing after the braising period. After this steaming period, the lid and water are removed and the oven temperature is adjusted to 325° to 350° F. for the remainder of the roasting.

Young birds or those having a flexible tip on the rear end of the breast bone are placed on the roasting rack, with no lid and no water added. The position of the bird in the conventional method of roasting is with the breast up. The more recent practice is to place the bird on its side or squarely on its breast, depending upon the shape of the bird, and then turn in order from one side to the other every 45 minutes. Baste with pan drippings at each turning. Ducks and geese are self basting and the skin should be pricked with a fork during the roasting process to allow some of the fat to drain.

A bird cooked according to a time schedule may or may not be done because of various conditions that may enter in such as

Remember that it is not the lean meat that changes in flavor in zero storage nearly as much as the fat. The oxygen in air will combine with unsaturated fats and break them down into free fatty acids and aldehydes, giving them a stale, rancid flavor. This flavor is, in part, absorbed by the lean. That is the reason for using a good grade of wrapping paper, one that is moisture-vapor proof, and employing the drug store method of wrapping to exclude the air.

It is rather foolish to go to all this trouble, using expensive paper and tape and taking valuable time to do a good job, and then fling the package into a basket and rip it.

When roasting an unthawed cut, allow an additional 10 to 15 minutes per pound to the roasting time. The users of meat thermometers will have to insert it after the meat is partially cooked and the frost is out of the center.

Thaw meat in a refrigerator or in a warm kitchen—take your choice; the difference is speed and for more of that, use a warm oven.

Oil Coating Frozen Meats

Steaks, chops, and roasts may be defrosted in a vegetable oil and held at a refrigerator temperature of 35°-45° F. for a week without spoilage. The oil cover inhibits oxidation but results in a deep violet color to the meat. This color will disappear in the cooking.

When meats are to be cooked in the frozen state, the oil coating is for the purpose of altering the heat exchange characteristics of the meat surface. Where frozen meats are cooked and the heat is applied by convection or infra-red ray radiation, the surface crystals of water on the frozen meat begin to melt and the heat transfer occurs through moisture at a maximum temperature of 212° F. when it is vaporized into steam. In the case of meat coated with oil, the ability of the surface of the meat to absorb heat is raised to the boiling point of oil (400°-450° F.). This results in quicker cooking with less shrinkage.

COOKING AND CARVING POULTRY

Preparation

Frozen birds should be thawed. Remove the giblets and internal fat. Singe off the hair over a flame (gas burner or paper torch) if this has not been done. Remove any pin feathers and

Heat the oysters for several minutes and drain. Cook the parsley and onion for several minutes in the melted fat and add it and the drained oysters to the bread crumbs.

Sausage Bread Stuffing

(12 pound turkey)

1 pound sausage	2 tablespoons diced onion
2 eggs	1 teaspoon salt
1 cup milk	4 tablespoons chopped parsley
7 cups bread crumbs	1 cup diced celery

Pan fry the sausage until brown and drain off the fat. Beat the eggs slightly and add hot milk. Pour the egg mixture over the remaining ingredients.

Savory Stuffing

(12 pound turkey)

¼ cup butter or other fat	8-10 cups bread crumbs
1 pint chopped celery	1- 2 teaspoons savory seasoning
½ cup chopped parsley	1- 2 teaspoons salt
1 small onion chopped	Pepper to taste

Cook the celery, parsley, and onion in the melted fat for several minutes. Add to the bread crumbs and dry seasoning and mix. Add nuts, if desired. If chestnuts are used, boil them in water for 15 minutes, and remove the shell and brown skin while still hot.

Roasting Time Table for Young Birds

Kind	Weight	Oven Temp.	Hours
Chicken	4 to 5 lbs.	350° F.	1½ to 2 hrs.
Duck	5 to 6 lbs.	350° F.	2 to 2½ hrs.
Goose	10 to 12 lbs	325° F.	3 to 4 hrs.
Guinea	2 to 2½ lbs.	350° F.	1½ hrs.
Turkey	6 to 9 lbs.	325° F.	2½ to 3 hrs.
	10 to 13 lbs.	325° F.	3 to 4 hrs.
	14 to 17 lbs	300° F.	4 to 5 hrs.
	18 to 25 lbs.	275° F.	6 to 8 hrs.

Broiling

Young, plump birds split into halves are the only ones suitable for this purpose. The distance of the broiler rack from the

age, weight, oven temperature, air circulation, etc. Some of the indications of doneness are a slightly shrunken flesh beneath the skin, a flexibility of the leg joint, and the absence of any pink juice when the flesh of the thigh is pricked with a fork or a skewer. Large birds with thick thighs had better have the drum sticks released from the cord that binds them to the body when the roasting period is about three fourths completed. This permits the heat to circulate more readily around the thick, meaty thighs.

The giblets are simmered to tenderness before adding them to the gravy. The neck may be cooked with the giblets. The liver needs only about 15 minutes of cooking and should be added during the last period. Allow 1 to 1½ hours for chicken giblets and 2 to 3 hours for turkey giblets. If the giblets are to be incorporated with the stuffing, they should be cooked the previous day.

Stuffing

The ingredients that furnish the bulk to a stuffing are starchy in nature and consist either of bread crumbs, boiled rice, or mashed potatoes. To get added richness of flavor, melted butter or some melted fat taken from the body of the bird is added. The seasoning vegetables consist of celery, parsley, and onion. The spices or herbs that are in favor consist of thyme, sweet marjoram, pepper, and sage. Other ingredients that add variety to a stuffing are oysters, nuts, mushrooms, dried apricots or prunes, sausage, raisins, diced salt pork fried crisp, and sliced apple.

The dry stuffing is made of medium dry crumbs without milk or water added. The moist stuffing is made with crumbs, milk or water added, or with a base of boiled rice or potatoes.

A 4 to 5 pound bird will require about 4 cups of crumbs, and a 14 to 15 pound turkey will require from 10 to 12 cups of crumbs. An ordinary 1 pound loaf of bread (2 to 4 days old) will make approximately 4 to 5 cups of crumbs. Use 1 cup less of boiled rice than bread crumbs because the rice will swell.

Oyster Stuffing
(12 pound turkey)

1½ pints oysters	8-10 cups bread crumbs
¾ cup butter or other fat	½ teaspoon savory seasoning
⅛ cup chopped parsley	1 to 2 teaspoons celery salt
1 tablespoon chopped onion	

Stewing

Stewing is employed more universally than any other method because it produces a more tender and flavorous product. The flavor is due in large part to the type of bird used for stewing. The old bird is high in flavor. The same thing is true of all meat animals. High flavor depends upon the amount of water soluble proteins and fat. These increase with the age of the animal or fowl. What is more delicious than a fat hen that has been stewed until she can no longer hold her beautiful form but simply disintegrates when speared with a fork! Or that tough old rooster whose morning crow announced the dawn and disrupted many a laggard's sleep—dismember him with strong hands and stony heart, place him in a kettle half filled with water slightly salted, cover and simmer and simmer. The old codger may need more water but stint him not—give him more. Subjected to 4 or 5 hours or maybe less of this treatment, served with a flour thickened gravy, and his gastronomic appeal has such shocking import that it may bring remorse. Cooked any other way and he would be damned. And what a soup he makes—even his feet! He has uses no end. Chicken fricasse, chicken gumbo, chicken noodle soup, chicken consomme, cream of chicken soup, jellied chicken, chicken sandwich, chicken salad, chicken chop suey, chicken timbales, chicken risotto, chicken mousse, chicken souffle, chicken croquettes, chicken a la king, chicken loaf, creamed chicken, curried chicken, and add your own.

CARVING

The conventional method of carving pursued by most hosts is done with the bird on its back. The more recent method is to carve the bird as it rests on its side. With the bird on its back, the first step is to turn the platter with the legs of the bird pointing toward the carver. Grasp the end of the leg with the fingers of the left hand and cut between the leg and the body. Pull the point of the knife through the joint and sever the skin between the leg and back. Lift the leg to a second plate, if the platter space is limited, and separate the drum-stick from the second joint or thigh. The dark meat is sliced from the second joint and also from the drumstick if it is too large for a single serving. Remove the wing by cutting around the area where it appears to join the body and force it toward the back.

flame will vary with different ovens but a temperature of 375°-400° F. is desirable. This makes it necessary to have the broiler rack 3 inches from the flame in some ovens and from 4 to 7 inches away in others. The speed at which the bird browns will govern the distance to use. A 2 pound broiler should cook in 35 to 45 minutes.

Coat the bird with melted fat, season with salt and pepper, and sprinkle with flour if desired. Start with the skin side away from the broiler heat and turn several times as it browns. A good practice is to partly cook the bird in a 350° F. oven and then broil. Small 3 to 5 pound turkeys, squab, guinea, and ducklings are broiled in the same manner.

Frying

Pan frying is more widely practiced than broiling. Various methods are used and all have enthusiastic supporters. One method consists of steaming the disjointed bird in a 300° F. oven until practically tender and then dipping each joint in a beaten egg and rolling it in bread or cracker crumbs or in corn meal. Place in a thick skillet that contains melted butter or ½ inch of melted fat and brown quickly. Salt and pepper are added to the steamed bird.

Another method is to bread each joint, put the thickest pieces in the pan first, and have sufficient fat to come up around each piece. Cover the pan to avoid spattering, and cook at moderate or medium heat until brown, turning each piece as it browns. This requires from 20 to 25 minutes for chicken. It may be finished in a moderate oven (325° F.).

Turkey Steak

The method of cutting the steak governs its preparation. The steaks made by cutting crossways to the body are dipped in egg, seasoned with celery salt, pepper, and a pinch of rubbed parsley, and rolled in crumbs. Brown the steak in a skillet with ¼ to ½ inch of fat, and then steam in a roaster until tender (30 to 45 minutes).

If the boneless steaks have been tenderized by running them through a steak machine, they can be seasoned and broiled, or breaded, seasoned, and fried in deep fat. A short steaming period will make them more tender but is not necessary. The secret in flavoring turkey steak lies in the use of celery salt and finely ground parsley.

plates put in its place. Put a spoonful of stuffing on the plate and a portion of white and dark meat on top or beside it. Some prefer to serve as they remove a slice of breast meat but this slows up the serving since it means extra handling of tools between each operation.

The illustrations on carving a bird on its side show that this method has the advantage of making the breast easier to carve, and eliminates handling the second wing joint and the thigh as separate pieces.

The breast of duck or goose is too shallow to be carved in the same manner as turkey, chicken, or guinea. Instead, cut long thin slices with the grain and parallel to the ridge or keel bone and then cut them into portions across the grain if they are too large. Another method consists of lifting the entire breast from the keel, loosening it with the point of the knife, and placing it on a separate plate. Portions for serving are made by cutting across the grain of the meat.

A napkin and not the tongue is used to wipe the fingers of the carver. Remember that the children are watching!

Fig. 10.2—Carving poultry (breast up). Slicing the breast meat. (Photo by Peter Killian; courtesy, U. S. D. A.)

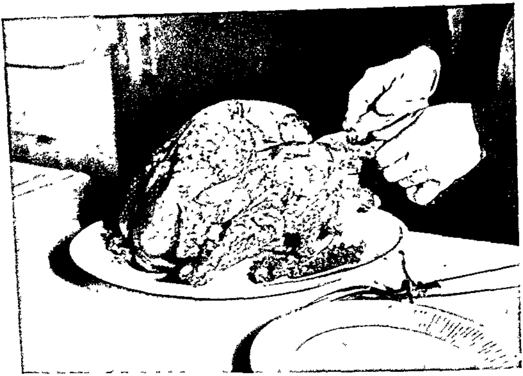


Fig. 19.1—Carving poultry (breast up). Removing the leg. (Photo by Peter Killian; courtesy, U. S. D. A.)

If the bird is on its side, remove the wing between the first and second joint, leaving the second joint attached to the bird. Remove the drumstick, leaving the thigh attached to the body. This ends the most difficult part of the carving operation. Many a tragedy has occurred in disjointing a bird.

Slicing the breast meat by slicing down and away from the carver is the most comfortable method for a host who stands to carve a bird resting on its back. Most experts recommend placing the fork squarely across the breastbone toward the end of the keel. This places the left hand, which is steadying the bird with the fork, in a position that does not interfere with the right hand.

When carving in a sitting position, however, the breast must be next to the carver, in which case the right hand is working under the left arm. To avoid this unnatural position, point the front of the bird toward the carver, place the fork into the opposite breast several inches below the keel, and slice as in the standing position. The slices of white breast meat can be arranged opposite the cuts of dark meat on a separate plate. When sufficient servings have been made or the one side of the bird is carved, shove the platter away from the carver and have the

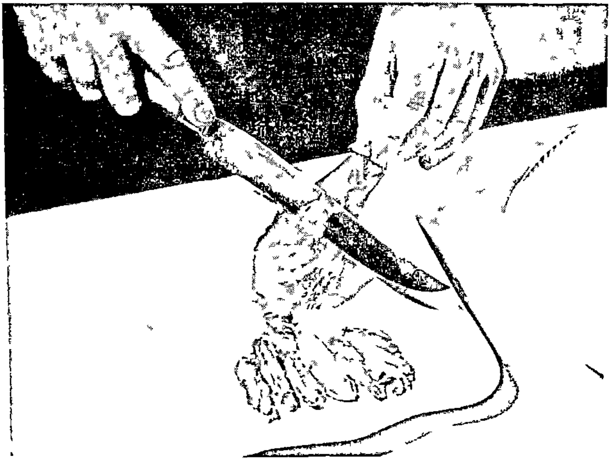


Fig 19 5—Slice the drumstick meat Hold the drumstick upright and cut down parallel with the bone turning the leg to get uniform slices

Fig 19 6—Slice the thigh meat Anchoring the fork where it is most convenient to steady the bird cut slices parallel to the body until the bone is reached and remove the slices to the side platter Run the point of the knife around the thigh bone lift up with the fork and use either fork or fingers to remove the bone to the side platter Then slice the remaining thigh meat.

Fig. 19.3—Remove the wing portion. Grasp the wing tip firmly between thumb and fingers, lift up, and sever between the first and second joints. Drop the wing tip and first-joint portion to the side platter. The *second joint is left attached to the bird.*

Fig 19.4—Remove the drumstick. Grasp the end of the drumstick, and lift it up and away from the body, disjointing it at the thigh; then transfer the drumstick to the side platter for slicing the meat. The thigh is left attached to the bird.

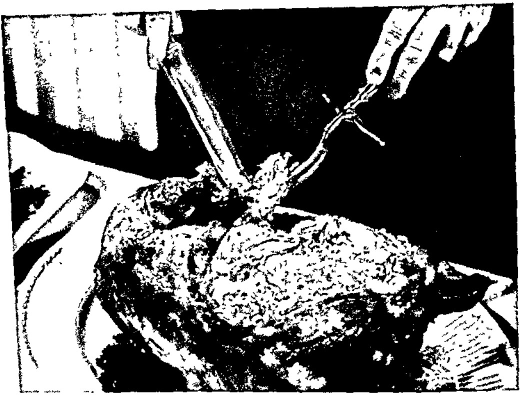


Fig. 19.7—Remove the "oyster." The choice dark meat above the thigh and adjoining backbone is called the "oyster." Use the point of the knife to lift it out of its spoon-shaped cradle.

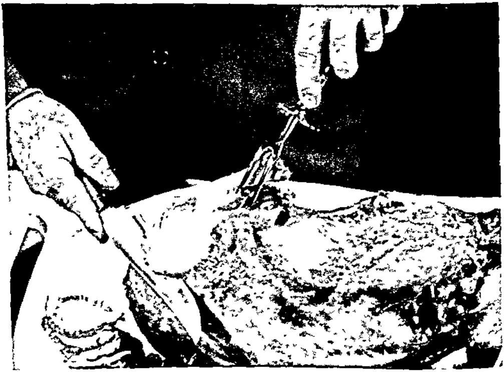


Fig 19.8—Cut short breast slices until the wing socket is exposed. Sever the second joint of the wing and transfer it to the side platter. Slice the meat in the same manner as drumstick meat.

Provide covers for the pit. These may consist of pieces of corrugated sheet iron or rough boards. In case the latter are used, they should be covered with tarpaulins to keep the dirt from sifting through since the final seal will be made by using about a foot of dirt over the top. If steam leaks occur, they are plugged with more dirt.

MAKING THE BED OF HOT COALS

Dry oak or hickory wood, measuring from four to five inches in diameter and cut in two- to three-feet lengths, is best in producing the 15- to 18-inch bed of hot coals. Apple wood is satisfactory but the soft and resinous woods are not. Any chunks of wood that are not burned to coals should be removed from the pit or moved to one end by the use of a long rod with a hooked end. Allow four or five hours for producing the bed of coals. It requires twice the volume of the pit in wood to make the desired bed of coals, or 1 cord (1 ton) per 7 feet of pit length. Inefficient cooking, to say the least!

THE SAND COATING

The hot coals must have an over-coating of dry sand or fine gravel to the depth of one inch. If the sand or gravel is moist, place sheet iron over part of the pit, spread the sand on it, and stir occasionally to dry while the wood is burning. Wet sand will produce too much smoke.

The Meat

Any of the better grades of meat, poultry, or game are suitable for barbecuing, although beef is the most popular. The boneless cuts are a decided advantage for speed in carving, which is necessary when serving large groups. It is important to have each cut as nearly the same thickness as possible in order that they will cook uniformly.

The meat must be liberally seasoned with salt and pepper before being partially wrapped in aluminum foil. Use .0015 gauge foil with the drugstore lock wrap lengthwise, but leave the ends partly open to form a tube that will not scoop up sand. Place the tube-style wrapped meats on the hot sand by using a three-tined fork, the tines of which are bent into a right-angled curve to hold the roast. Place the creased fold part of the aluminum foil down on the fork and roll it off into position on the hot sand with the crease up. When all the meat is in position, place

BARBECUING

This method of preparing meat has found great favor in roadside inns and is accomplished by several different processes.

1. *Open Fire*—The cut (generally ham or beef round) is attached to a metal rod that is mechanically rotated close to a layer of burning charcoal which glows through the grates. Steaks, chops, and kabobs are grilled on the grate.

2. *Indirect Heat*—The cut is coated with a half-inch layer of dough and placed in an oven (400° F.) to roast. This is the least wasteful method since there is no charred meat and the product is very tasty and juicy.

Although entire hind quarters of beef are barbecued by the open fire method, a more tasty product will be secured if prepared according to a method prescribed by the American Hereford Cattle Breeders' Association. It is known as the "Trench method."

The Open Trench (Pit) Method

Barbecuing meat by this method has become one of the most popular means of preparing meat for large rural gatherings, particularly of the livestock interests. It gained considerable political stature when Governor J. A. Walton, of Oklahoma, used it to feed over 100,000 people at his inauguration.

To prepare the barbecued beef, pork, lamb, buffalo, deer, antelope, duck, goose, chicken, rabbit, squirrel, and opossum served on this occasion required one mile of trenches.

The cooking principle involved in this method of barbecuing is a combination of dry heat roasting and steaming. The steam is formed from the moisture in the meat and held in the sealed pit.

BUILDING THE TRENCH

The soil should not be sandy, but preferably a heavy soil containing plenty of clay. Sandy soil will require a brick lining to eliminate caving. Make the trench 3½ feet deep and 3 to 3½ feet wide. The length will depend upon the number of people to be served. A liberal serving is considered to be one-half pound (on a fresh meat basis) per person, or 50 pounds for 100 people. To barbecue 100 pounds of meat requires three feet of pit length; 200 pounds—5 feet; 400 pounds—10 feet; 600 pounds—15 feet; and 800 pounds—20 feet; etc.

Serving

Have separate tables for those doing the carving. The serving tables, size 3 feet x 10 feet, set on trestles, should be covered with clean wrapping paper and the paper plates, paper napkins, and wooden or paper forks and spoons placed at the head end. Follow this by a systematic arrangement, such as buns, meat, potatoes, salad, relishes, dessert, and beverage. The serving may be run as self-service or attendants may fill the plate completely (excepting relish and beverage) before handing it to the guest.

Home Made Barbecue Grills

Use regular-size concrete building blocks for the walls, placing them end to end from two to three tiers high. The width of space between the lateral walls varies from 3 to 5 feet. The ends may be open or closed. Pressed charcoal briquettes are lodged in piles on the ground or gravel base and lighted with lighter fluid. Start the fire one to two hours before serving time. When the briquettes show gray areas (15-20 minutes), the piles can be leveled.

Metal reinforced grills are made with a frame of one inch pipe, with a grill surface 3 feet wide and 4 feet long, made of #9 gauge wire with 2 inch mesh. Only one section of the grill has long handles; the other matching half is attached with

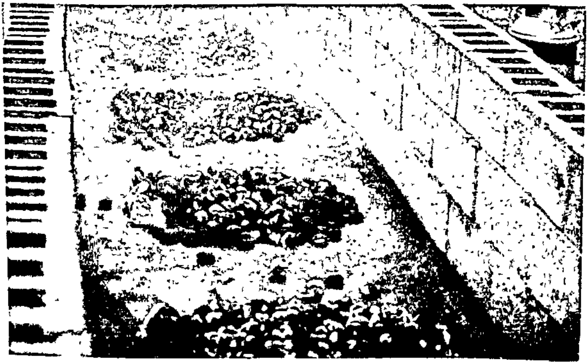


Fig. 19.11—Grill walls made of concrete blocks.

the cover over the pit and seal it with eight to twelve inches of dirt. Be certain that the framework or sheet iron covering is strongly reinforced to prevent the top from falling into the pit.

Allow twelve hours for barbecuing and four to five hours for building the bed of coals. Do not open the pit until shortly before serving is to begin.

Barbecue Sauce

Regardless of what the author may think of sauces or condiments other than salt and pepper for destroying the flavor of good meat, the majority rules and sauce it must be.

A sauce recommended by authorities with experience in its use is made as follows:

- 6 bottles catsup (74 oz.)
- 3 bottles Worcestershire sauce (18 oz.)
- ½ bottle prepared mustard (6 oz.)
- 2 cups prepared barbecue sauce (on sale in groceries)

Mix and heat. Serve hot. This is sufficient for 100 people. Dutchmen might prefer straight horseradish, so have some on hand.

Barbecue Menu for 100 People

Professor J. W. Cole, of the University of Tennessee, reports the following needs:

- Meat—50 pounds (boned and rolled)
- Buns—200 (sliced almost through and buttered)
- Potatoes—6 pounds potato chips, or 30 pounds scalloped potatoes, or 100 pounds baked potatoes
- Beans— 30 pounds, baked
- Salad—30 pounds potato salad, with pickles, eggs, etc., or
  20 pounds cabbage salad, with dressing, or
  15 to 20 pounds lettuce salad, with dressing
- Pickles—1 gallon
- Coffee—7 to 8 gallons (2 pounds of regular grind in a cloth bag, placed in a 10 gallon cream can with water, and boiled for three to five minutes)
- Dessert—100 cups of ice cream, cup cakes, or fruit in season

table); (2) that whenever possible, carving should be done across the grain of the meat; (3) that the carving platter should be of ample size (it is embarrassing to serve cuts from the table cloth or the lap); (4) that the purpose of the fork is to hold the cut and not to dull the knife; and finally (5) that small, loose, striated pieces will make a fool of any instrument but a pair of molars

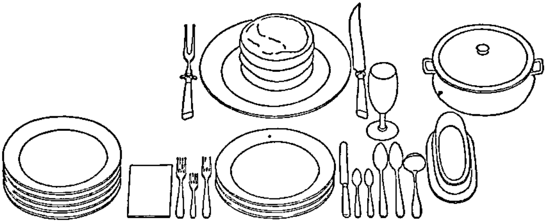


Fig. 19.13—

or a meat grinder and should be ignored. If a piece of meat will not hold together or desires to run a race around the platter, do not attract the attention of the guests by condemning the meat, or the cook, or your own shortcomings as a carver, but work swiftly and quietly.

In order to do a commendable job, the carver must have elbow room and plenty of platter space. If it is more convenient to stand while carving, he should do so. Standing is particularly convenient for those sporting oversize waistlines. The accompanying illustration shows an arrangement of the carver's place with one tantalizing tumbler placed in the danger zone. The salad, sherbet, water, coffee, or whatever food is before each guest should be placed before the carver by the waitress when he has finished his task. If he is also required to serve the vegetables, the dishes containing them should be conveniently grouped to his right or left in some sensible pattern that has practicability for its theme rather than artistic effect.

Serving can be hastened and more carving space made available if the hostess will serve the vegetables. She will also earn his gratitude if she will divert the guests' attention from his carving by injecting them with a conversational hypo. (This will not "take" on commiserating husbands or those who came to learn how or how not to carve.)

figure-8 slide hooks. The cuts of steak, chop, half chicken, burgers, kabobs, etc., are placed on the half of the grill that has the handles. The matching half (without handles) is placed over the meat and secured in place with the slide hooks. This permits two men, one on either side of the grill, to turn and baste the cuts. Hot butter containing some additional salt and some pepper is a good basting for practically all meats. It can be brushed on or sprayed on hot. In the case of chicken, the sauce consists of ½ pint of water, 1 pint of vinegar, ½ pound of butter, and 1 ounce of salt (sufficient for 10 halves of chicken).

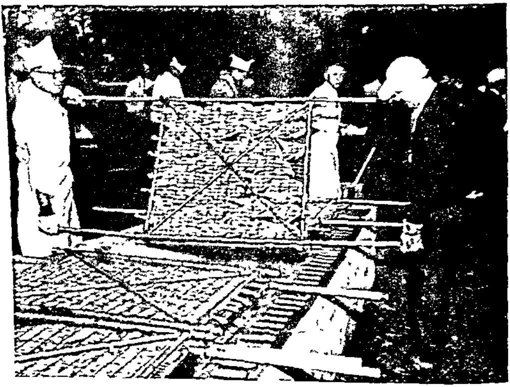
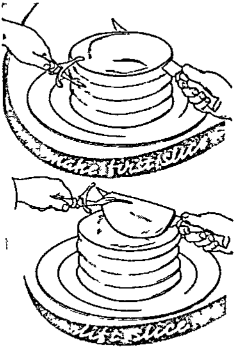


Fig. 10.12—The double flip-over grill.

CARVING

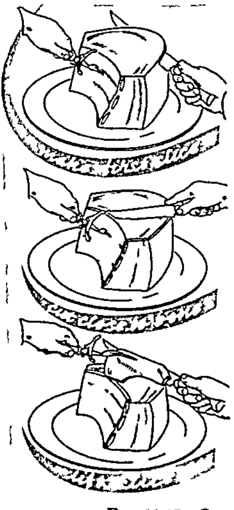
Carving should not be an objectionable task but a proud accomplishment. Demonstrating carving dexterity will invariably provoke the commendations of guests, which is certainly not objectionable. There is a certain technique or way of carving different cuts that is best explained by drawings. In addition to knowing how to carve, one must remember: (1) that the carving knife must be sharp (do not sharpen the knife at the



The roast is placed on the platter with the larger cut surface down

- Use the standard carving set or the slicer and carver's helper
- With the guard up, push the fork firmly into the roast on the left side an inch or two from the top
- Slice across the grain toward the fork from the far right side (first illustration) Uniform slices of an eighth to three eighths of an inch thick make desirable servings
- As each slice is carved, lift it to the side of the platter or to another hot serving platter (second illustration)
- Remove each cord only as it is approached in making slices Sever it with the tip of the blade, loosen it with the fork, and place it to one side

Fig 19 14—Carving a rolled rib roast of beef[1]



When a standing rib roast is purchased the meat retailer will, on request, remove the short ribs and separate the backbone from the ribs The backbone can then be removed in the kitchen after roasting This makes the carving much easier, as only the rib bones remain

The roast is placed on the platter with the small cut surface up and the rib side to your left.

- Either the standard carving set or the roast meat slicer and carver's helper can be used on this roast
- With the guard up, insert the fork firmly between the two top ribs From the far outside edge slice across the grain toward the ribs (first illustration) Make the slices an eighth to three-eighths of an inch thick
- Release each slice by cutting closely along the rib with the knife tip (second illustration)
- After each cut, lift the slice on the blade of the knife to the side of the platter (third illustration) If the platter is not large enough, have another hot platter near to receive the slices
- Make sufficient slices to serve all guests before transferring the servings to individual plates

Fig 19 15—Carving a standing rib roast of beef

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[1] All prints on carving are by courtesy of the National Livestock and Meat Board

A carver should always appear at ease and this is not true when the hand holding the fork is crossed over the hand doing the carving. In the case of pot roasts from the chuck, carving is simplified by cutting out solid chunks and turning them in position to make possible the carving of neat slices across the grain. It is not bad form to serve small slices, but it is rather embarrassing to serve large, straggly pieces with trailers.

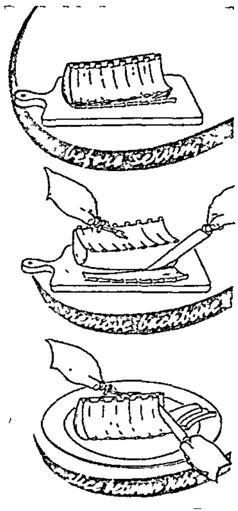
Porterhouse steak is a cut that requires a little thought in carving because the tenderloin muscle is large enough for only a single serving. A good way to handle this situation is to remove the T-shaped bone and then carve across the tenderloin and loin muscle, giving a piece of each as a serving.

Carving a ham or leg of lamb is simplified by first slicing the meat from the front of the ham or leg (just above the stifle joint and anterior to the humerus). This permits the cut to be placed on the flat carved surface with the back or meaty part of the cut on top. Now begin the carving just above the hock and continue slicing without removing the slices until they are sufficient for completing the service. Then remove a wedge-shaped piece next to the first slice at the hock. This makes room for flattening the knife so that all the slices can be cut and lifted from the bone with one final carving motion. For further carving, place the roast on its side and slice as before.

A familiarity with anatomy is of course of inestimable value in efficient carving. By efficient carving is meant the greatest number of neat slices. The arguments that meat is meat; it all goes to the same place; they have to be cut and mangled anyway; the small brown pieces are the best; nothing goes to waste but all to the waist, so why be fussy; will not satisfy the housewife who takes pride in neatness and gastronomic appeal.

SOME INSTITUTIONAL MANAGEMENT PROBLEMS

The operation of dining commons in state and federal welfare institutions presents many problems in dealing with grades of meat, the form in which they should be purchased, their cutting, and their preparation. Where economy, because of budget limitations, is the paramount issue, quantity and quality of meat purchases will naturally suffer. This does not mean that hash from cutter and canner stock must be the main dish. It is a challenge to a steward to make his kitchen a laboratory in which to discover: (1) what grades of meat best suit his special needs



It is much easier to carve a pork loin roast if the backbone is separated from the ribs. This is done at the market by sawing across the ribs close to the backbone. The backbone becomes loosened during roasting; note in the first illustration that it has fallen away from the ribs.

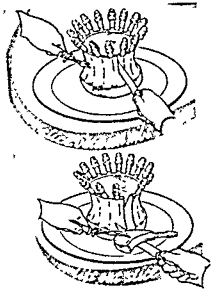
- The standard carving set is preferred for carving the pork loin, although a smaller size may be used.
- Before the roast is brought to the table remove the backbone by cutting between it and the rib ends (second illustration).
- The roast is placed on the platter so that the rib side faces you. This makes it easy to follow the rib bones, which are the guides for slicing. Make sure of the slant of the ribs before you carve, as all the ribs are not perpendicular to the platter.
- Insert the fork firmly in the top of the roast. Cut closely against both sides of each rib. You alternately make one slice with a bone and one without. Roast pork is more tempting when sliced fairly thin. In a small loin each slice may contain a rib; if the loin is large it is possible to cut two boneless slices between ribs.
- Two slices for each person is the usual serving.

Fig. 19.18—Carving a loin roast of pork.

from the standpoint of complete utilization, consumer satisfaction, and cost per serving; (2) what advantages there may be in buying meat in the carcass as compared to wholesale and boneless cuts, fresh as compared to frozen, and from the packer as compared to the jobber; (3) what cuts furnish satisfactory roasts, steaks, etc., at the lowest cost per serving (for example —chucks as compared to round for roasts); (4) what method of cutting is best adapted to utilization of all the meat; and (5) what new and different ways the same cuts may be prepared and served so as to relieve the monotony so often prevalent.

The Cutting and Cooking Test

The most businesslike approach to the solution of these problems is to make cutting tests on carcasses and cuts of different grades and price levels, and thereby determine actual costs of servings. For example, if boneless beef is required for roasts and good grade chucks are quoted at 39 cents, good grade rounds at 42 cents, and 6- to 8-pound chuck rolls at 47 cents, which is the most satisfactory and economical buy for that purpose? The



A lamb crown roast is made from the rack, or rib section, of the lamb. A pork crown is made from the rib sections of two or more loins of pork. Either cut is carved in a method similar to that of the pork loin roast.

• Use a standard carving set.

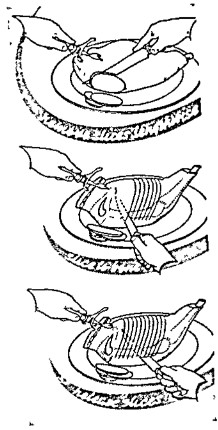
• Move to the side of the platter any garnish in the center which may interfere with carving. Dressing can be cut and served along with the slices.

• Steady the roast by placing the fork firmly between the ribs.

• Cut down between the ribs, allowing one rib to each slice (first illustration).

• Lift the slice on the knife blade, using the fork to steady it (second illustration).

Fig. 19.16—Carving a crown roast of lamb.



The leg of lamb should be placed before the carver so that the shank bone is to his right and the thick meaty section, or cushion, is on the far side of the platter. Different roasts will not always have the same surface uppermost because of the difference in right and left legs. However, this does not affect the method of carving. The illustrations show a right leg of lamb resting on the large smooth side.

• A standard carving set is a convenient size for this roast.

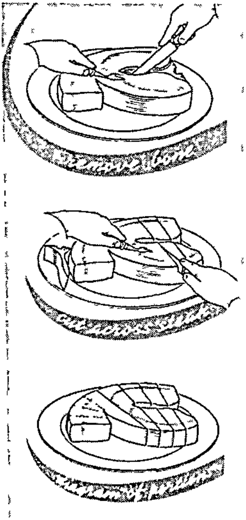
• Insert the fork firmly in the large end of the leg and carve two or three lengthwise slices from the near thin side (first illustration).

• Turn the roast so that it rests on the surface just cut. The shank bone now points up from the platter.

• Insert the fork in the left of the roast. Starting at the shank end slice down to the leg bone. Parallel slices may be made until the aitchbone is reached (second illustration). One-quarter to three-eighths of an inch is a desirable thickness.

• With the fork still in place, run the knife along the leg bone and release all the slices.

Fig. 19.17—Carving a leg of lamb.



Contrary to most carving rules, a steak is carved with the grain. A steak need not be cut across the grain because the meat fibers are tender and already relatively short.

• Use the steak set, with a knife-blade of six or seven inches.

• Holding the steak with the fork inserted at the left, cut closely around the bone (first illustration). Then lift the bone to the side of the platter where it will not interfere with the carving.

• With the fork in position, cut across *the full width of the steak (second illustration).* Make wedge-shaped portions, widest at the far side. Each serving will be a piece of the tenderloin and a piece of the large muscle.

• Serve the flank end last if additional servings are needed (third illustration).

In order to protect the cutting edge of the knife, as well as the platter, a board cut to fit the center section of the steak is almost a necessity when carving a steak.

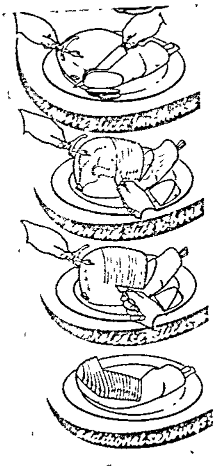
Fig. 19.20—Carving a porterhouse steak.

policy *is to use the better grades for chops, steaks, and roasts,* and have some of the *utility* grade on hand to incorporate with the more wasty cuts, thereby enabling the use of most of the excess fat. Whether hinds or fores should be used for this fat-saving purpose will depend upon the difference in price between the two, hinds being preferred by many. Hinds will usually average about 2% less bone than the fores. The tables on the physical composition of the beef carcass (Chapter XIII) and of lamb (Chapter XVIII) should be helpful in estimating the yield of edible meat from different grades of carcasses and cuts.

In the case of institutions having nonpaying clients or wards, it may be necessary, because of limited appropriations, to use the *standard, commercial,* and *utility* grades of meat.

Can Steak Be Cut from a Fore Quarter of Beef and If So, How Much?

Steak can be cut from the fore quarter, but it should be prepared as Swiss steak. The following is a cutting test made on a



The ham is placed on the platter with the fat or decorated side up. The shank end should always be to the carver's right. The thin side of the ham, from which the first slices are made, will be nearest or farthest from the carver, depending on whether the ham is from a right or a left side of pork. The illustration shows a left ham with the first slices cut nearest the carver. The diagram shows the bone structure and direction of the slices.

- Use a standard carving set or the slicer and carver's helper on the baked ham.
- Insert the fork and cut several slices parallel to the length of the ham on the nearest side (first illustration).
- Turn the ham so that it rests on the surface just cut. Hold the ham firmly with the fork and cut a small wedge from the shank end (second illustration). By removing this wedge the succeeding slices are easier to cut and to release from the bone.
- Keep the fork in place to steady the ham and cut thin slices down to the leg bone (second illustration).
- Release slices by cutting along bone at right angles to slices (third illustration).
- For more servings turn the ham back to its original position and slice at right angles to the bone (fourth illustration).

Fig. 19.19—Carving a roast ham.

table in Chapter XIII shows that the amount of bone in good grade rounds and chucks is the same, or 19%, but that rounds yield 2% more lean and 2% less fat. Will a 39-cent chuck, when boned, furnish chuck rolls under 47 cents per pound, and can chuck or round be cut to better advantage? Also, what will servings cost and how do the two compare in palatability and ease in serving? The answers are found by cutting and preparing the meat for the oven and then dividing the usable weight into the total cost. The cooked product when served will give further information as to shrinkage and actual number of servings secured per pound of fresh meat.

What Grade of Meat Should I Purchase?

The answer depends upon whether you are serving paying or nonpaying clients. *Choice* and *good* grades should be used for the former, but tasty meals can be prepared more economically from *standard, commercial,* and *utility* grades of meat. A good

What Is the Steak Yield from a Trimmed Beef Loin (Good Grade)?

Strip Loin	Boneless Hip	Fillet	Stew Meat	Fat	Bone
%	%	%	%	%	%
20	33	6	9	20	12

The above percentages were secured from good to choice loins (kidney out) weighing between 45 and 50 pounds.

Problem: What is the cost of these boneless cuts on the basis of current wholesale prices of Western style trimmed loins? On the basis of a 7-ounce steak, how many servings can be secured from a 50-pound loin, and what is the cost per serving after crediting stew meat (or hamburg), fat, and bone? Figure the same problem if the fillet is not served but credited at current market price.

What Is the Meat Yield from Fresh Hams of Different Weights?

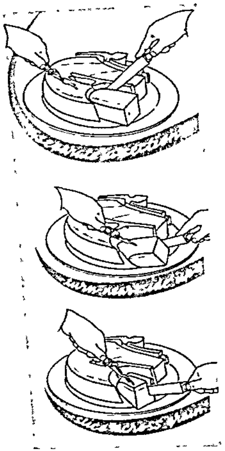
The following is a test made on 42 fresh hams of different weights.

No.	Wt. of Hams	Total Meat Yield	Roasts	Trimmings	Bone	Fat
		%	%	%	%	%
10	13½	83	76	7	11	6
7	14½	83	76	7	10.5	6.5
16	15½	82	75	7	10	8
9	17	81	74	7	9.5	9.5

Problem: Roast pork is on the menu for 500 guests. How many 15-pound hams must be provided and what will be the cost per serving if 4 ounces of the roasted pork are served per plate? (Use current market prices and credit lean trimmings at sausage price, and skin and fat at waste fat price.)

What Per Cent of Edible Ham Steak Can Be Cut from a Smoked Ham?

Much depends upon the method of cutting and the amount of the less desirable ham steaks you wish to use. When cut as recommended in Chapter XIV, a 16-pound ham will yield:



The blade pot-roast contains at least part of one rib and a portion of the blade bone. The long cooking process softens the tissues attached to the bones, therefore the bones can be slipped out easily before the roast is placed on the table.

- Either the steak set or the standard carving set may be used for carving the pot-roast.
- Hold the pot-roast firmly with the fork inserted at the left and separate a section by running the knife between two muscles, then close to the bone, if the bone has not been removed (first illustration).
- Turn the section just separated so that the grain of the meat is parallel with the platter (second illustration). This enables you to cut the slices across the grain of the meat.
- Holding the piece with the fork, cut slices of one-fourth to three-eighths of an inch thick (third illustration).
- Separate the remaining sections of the roast; note the direction of the meat fibers and carve across the grain.
- Two or three slices, depending on size, are served to each person.

Fig. 19.21—Carving a chuck or blade roast.

good grade fore quarter, boned as illustrated in Chapter XVI. The rib eye and shoulder clod muscles furnished the bulk of the steak. These steaks were cut into 4-ounce portions. The short ribs were cut with the bone left in. If the brisket is cut into pieces slightly smaller but similar in shape to those from the short rib and included with them, this method produces about 21% steak, 21% short rib, and 27% stew (or hamburg).

Cutting Test on a 169-pound Fore Quarter (Good Grade)

	Pounds	Per Cent
Steak	35	20.7
Short rib	25	14.8
Stew beef	45½	27.0
Brisket roll (roast or stew)	11	6.5
	116½	69.0
Bone	29½	17.4
Fat	23	13.6
	169	100.0

What Per Cent Loss Can I Expect in Slicing a Slab of Bacon?

The shape and trim of the bacon will have a large bearing on the waste. The rind (skin) on the bacon represents 3¾% to 6% of its weight, depending on whether it was removed by machine (3¾%) or by hand (4½%-6%). Slab trimmings amount to an additional 3%.

What Per Cent Loss Can I Expect in Slicing a Beef Liver?

A beef liver in good sound condition and well chilled should not show more than 2% to 3% waste. This is of course dependent upon the manner of slicing and the skill of the man doing the slicing.

How Can I Detect Cereal in Sausage?

Smear the cut surface of the sausage with iodine solution; a blue discoloration indicates that a starch flour has been added.

	Pounds	Per Cent	
Butt slices	2½	15.63	71.87
Center slices	8½	53.12	
Heel slices	½	3.12	
Aitchbone and hock for boiling	3½	21.88	
Skin and fat	1	6.25	
	16	100.00	

The above test shows a maximum slicing yield of 71.87 per cent.

What Pork Cuts Make the Best Sausage and Can I Save Money by Making My Own Sausage?

Fresh skinned pork shoulders of the better grades make an ideal sausage since shoulder meat has about the right proportion of lean to fat. In the lower grades of unfinished pork it will be necessary to use additional pork fat. Heavy shoulders from gilts and sows can generally be bought at a lower figure than light shoulders. Sausage trimmings may be bought from packers for sausage making on which the following assumed prices are to be used in working this problem:

Regular pork trimmings, 50% lean	24c per lb.
Special lean pork trimmings, 85%	43c per lb.
Extra lean pork trimmings, 95%	49c per lb.
Skinned pork shoulders	41c per lb.
Country style sausage, fresh in links	47c per lb.
Country style sausage, fresh in bulk	36c per lb.

Tests show that fresh skinned pork shoulders will yield approximately 85% sausage meat.

Sausage Test on a 20-pound Fresh Skinned Shoulder

17½ lb. sausage meat
2 lb. bone
½ lb. skin

Figuring 2 cents a pound for grinding and ½ cent per pound for seasoning, and considering that regular pork trimmings are generally too high in fat to be used alone (use with 50% of shoulder or special lean), determine the reply to the question.

Types of Service

The Federal Meat Grading Service engages in two main types of activities: (1) the grading and identification for grade of beef, veal, lamb, and mutton for sale on a grade basis through regular commercial channels, and (2) the examination and acceptance, for conformance with specifications for grade and other factors, of meats offered for delivery to federal, state, county, and municipal institutions which purchase meat on the basis of contract awards. This latter service covers all kinds of meats, meat products, and by-products.

The Meaning of Grade

Grade is a term used to denote the degree of conformation, finish, and quality possessed by a carcass or cut. Standards have been set up for the three grade factors mentioned, and it is the duty of the meat grader to follow these standards.

The eight grades for steer and heifer beef in use today are: prime, choice, good, standard, commercial, utility, cutter, and canner. Prior to July, 1939, the grade stamp included both the grade and the class; for example, U. S. Choice Steer or U. S. Choice Heifer. To make it simpler for the consumer to buy meat

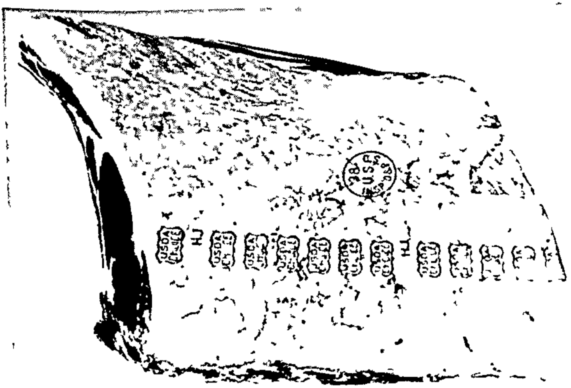


Fig. 20.1—The round inspection stamp and the grade stamp. (Courtesy, A.M.S., U.S.D.A.)

XX.

FEDERAL MEAT GRADING

On February 10, 1925, the 68th United States Congress passed an act setting up a Federal Meat Grading Service. The Bureau of Agricultural Economics at Washington, D. C. was designated the official agency for conducting the work and the first meat grading was started in May, 1927. The work was later allocated to the Agricultural Marketing Service, which was placed under the Food Distribution Administration in the fall of 1942.

At present, the Meat Grading Branch is under the Livestock Division of the Agricultural Marketing Service of the United States Department of Agriculture.

The Purpose of the Act

Producer and Processor

The act authorized the establishment of an inspection service for perishable farm products for the purpose of making available to individuals, organizations, and establishments, an agency that would certify the class, quality (grade), and condition of the products examined to conform with uniform standards.

Consumer

The government grade stamp on meat became a guarantee to the consumer that the meat bearing it is of the quality designated.

Inspection Requirements

Products, to be eligible for grading service, must be prepared under Federal inspection or other official inspection acceptable to the Administration.

acter of the chine and breast bones, the age and origin of the cattle considered. Quality is considered to be the most important of the three grade factors because it furnishes the most dependable criterion in determining the relative merit of beef to consumers.

Finish includes the amount, character, and distribution of the exterior, interior, inter-muscular, and intra-muscular fat. The principal significance of finish is that it is rather closely related to the quality of the beef and therefore provides a dependable guide as to its relative merit to the consumer.[2]

Conformation includes the general build, form, shape, or outline of the carcass, side, or cut. Its chief significance in grading is the close relationship that exists between conformation and the relative percentage of each major wholesale cut in the carcass as well as the proportion of edible meat to bone.

APPLICATION OF STANDARDS

The standards as outlined provide for the grading of beef produced from steers, heifers, and cows on its characteristics as beef without sex identification. Beef placed within each respective grade, therefore, will possess the characteristics specified for that grade, irrespective of the sex of the animal from which it was derived.

The following standards for grade apply to beef produced from cattle that are beyond the calf stage in age and maturity. It is recognized that the degree of finish and marbling, as well as other characteristics in beef, relate to some extent to the age of the cattle from which it was produced. Therefore, somewhat less finish and less extensive marbling than that specified in the grade descriptions are permitted in each respective grade in beef produced from young cattle, providing the degree of perfection in conformation and the character of the fat possessed by such beef meet the requirements for that grade. Likewise, somewhat more finish and more extensive marbling than that specified are required in beef produced from cattle that are relatively advanced in age and maturity. In grading beef, the degree of finish and marbling characteristic of beef of approximately the age, weight,

[2] The specifications for Official United States Standards for Grades of Carcass Beef were amended, effective October 8, 1949, by deleting all portions of the specifications wherein color of fat is referred to as being a grade factor.

on the basis of quality, the class names such as steer, heifer, and cow were dropped. Class is not included on wholesale grading certificates unless specifically requested.

Because of variations occurring in a grade, the trade recognizes three segments in each grade, referred to as top, average, and low.

In all cases the only identification is a recognition stamp placed on the carcass which identifies the product as being in accordance with the terms of the contract, for which the grader issues a certificate to this effect.

The letters AA, A, B, C, and D, used for denoting meat grades during the operation of the Office of Price Administration (O.P.A.) are not official U. S. grades and should not be construed as such. These letter grades were in effect from July 13, 1942, until October 15, 1946, and were for the purpose of providing isolated packers and local slaughterers a means of identifying grades on meat when it was not possible for the U. S. D. A. to provide the service.

In December, 1950, the official standards for grades of steer, heifer, and cow beef were amended by combining the Prime and Choice grades and designating them as Prime, renaming the Good grade as Choice, and dividing the Commercial grade into two grades by designating the beef produced from young animals included in the top half of the grade as Good while retaining the Commercial grade designation for the remainder of the beef in that grade. Other revisions in the standards for the Prime, Choice, Good, and Commercial grades were made to clarify them and to facilitate their interpretation. Standards for the Utility, Cutter, and Canner grades were not affected.

In June, 1956, the official standards for grades of steer, heifer, and cow beef were again amended by dividing the Commercial grade into two grades strictly on the basis of maturity, with beef produced from young animals being designated as Standard while Commercial was retained as the grade name for beef produced from mature animals.

The following are definitions of the grade factors as they apply to beef, taken from the official United States Revised Standards for Grades of Carcass Beef.

Quality is indicated by such factors as the color and texture of the lean, the firmness of the lean and fat, and the degree of marbling of the beef. It is also indicated by the color and char-

SPECIFICATIONS FOR OFFICIAL UNITED STATES STANDARDS FOR GRADES OF CARCASS BEEF (STEER, HEIFER, AND COW)

Prime

Prime grade beef carcasses and wholesale cuts are blocky and compact and very thickly fleshed throughout. Loins and ribs are thick and full. The rounds are plump and the plumpness extends well down toward the hocks. The chucks are thick and the necks and shanks short. The fat covering is fairly smooth and uniformly distributed over the exterior surface of the carcass. The interior fat is abundant in the pelvic cavity and over the kidney. The protrusion of fat between the chine bones is liberal and the overflow of fat over the inside of the ribs is abundant and fairly evenly distributed. The intermingling of fat with the lean in evidence between the ribs, called feathering, is extensive. Both the interior and exterior fats are firm, brittle, and somewhat waxy, but the interior fat may be slightly wavy or rough. The cut surface of the rib eye muscle is firm and has a smooth, velvety appearance. It has abundant marbling and the marbling is extensive, especially in the heavier carcasses. The color may range from a pale red to a deep blood red but shall be uniform and bright. The chine bones are usually soft and red, terminating in soft, pearly white cartilages.

Carcasses showing evidence of maximum maturity permitted in the Prime grade have chine bones tinged with white, and cartilages on the end of the chine bones are slightly ossified. Carcasses must also be symmetrical and uniform in contour, and the rib eye muscle must be fine in texture.

Regardless of the extent to which other grade factors may exceed the minimum requirements for the grade, a carcass must have certain evidences of quality to be eligible for the Prime grade. The cut surface of the muscle must be firm, fine in texture, and bright in color. Slightly abundant marbling must be evident in the rib eye muscles of carcasses with soft, red chine bones terminating in soft pearly white cartilages. Progressively more marbling is required in carcasses with evidences of more advanced maturity. Carcasses which are only moderately compact and blocky with only moderately plump rounds and moderately thick fleshing may meet the minimum requirements for the Prime grade provided they have finish and evidences of quality equivalent to the midpoint of the Prime grade.

and maturity being graded should therefore be taken into consideration.

All carcass beef and beef cuts possess each of the three grading characteristics—*conformation, finish,* and *quality*—in varying degrees. A range of variation with respect to each of the three grade characteristics is therefore included within each grade. The standards for grade are intended to describe only the characteristics of carcass beef and wholesale cuts that are representative of the midpoint of each grade. It is recognized that there will be included within the limits of each grade, some carcasses and cuts that are superior to, and others that are inferior to those described as representative of the grade. Grade is determined on the basis of a composite evaluation of these three factors, and a carcass or cut placed within any grade may possess characteristics that are common to another grade with respect to one, or possibly two, of these characteristics.

The following grade descriptions are defined primarily in terms of carcass beef. They also are applicable to wholesale cuts. It is recognized, however, that all of the wholesale cuts produced from a carcass may not be of the same grade as the carcass from which they were produced.

Standard Grades for Carcass Beef

There are eight grades for beef from steers and heifers, seven grades for beef from cows, and six grades for beef from bulls and stags. These are listed in the following schedule of grades:

Schedule—Standard Market Classes and Grades for Dressed Beef.

Class	Grade	Class	Grade
Steer, heifer, and cow[1]	Prime	Bull and stag	Choice
	Choice		Good
	Good		Commercial
	Standard		Utility
	Commercial		Cutter
	Utility		Canner
	Cutter		
	Canner		

[1]Cow beef is not eligible for Prime grade.

Regardless of the extent to which other grade factors may exceed the minimum requirements for the grade, carcasses whose flesh is moderately soft and slightly watery are not eligible for the Choice grade. The minimum marbling permitted will vary from a small amount in very red-boned, light-weight carcasses to a moderate amount in carcasses approaching the maximum maturity permitted. Carcasses which are slightly compact and blocky and with slightly plump rounds and slightly thick fleshing may meet the minimum requirements for the grade provided they have finish and evidences of quality equivalent to the midpoint of the Choice grade.

Beef produced from steers, heifers, and young cows may qualify for the Choice grade.

Good

Good grade beef carcasses and wholesale cuts are slightly compact and blocky in conformation and the fleshing tends to be slightly thick throughout. Loins and ribs are slightly full and the rounds are only slightly plump. Chucks are slightly thick and full and the neck and fore shanks tend to be slightly long and thin. The fat covering of beef within the grade will vary within moderate limits, depending on the evidences of maturity of the cattle from which it was produced. Carcasses whose chine bones are soft and red and which terminate in soft, pearly white cartilages have a thin exterior fat covering over loins and ribs and over portions of the rounds and chucks. In such beef there will be only a slight protrusion of fat between the chine bones, only a small overflow of fat over the inside of the ribs, and only a small quantity of feathering between the ribs. Carcasses whose chine bones are tinged with white and which terminate in cartilages in which some ossification is evident will usually possess a slightly thick exterior fat covering which extends over most of the rounds and chucks. They will have slight protrusions of fat between the chine bones and slightly abundant overflow fat and feathering. The fat may be somewhat soft or slightly oily. Characteristics of the cut surface of the rib eye muscle will vary depending on evidences of maturity attained by the animal from which it was produced. In carcasses whose chine bones are soft and red and which terminate in soft, pearly-white cartilages the rib eye has a slight amount of marbling and is usually moderately soft but fine in texture. Carcasses whose chine bones are tinged with white and which terminate in cartilages in which

Only beef produced from steers and heifers will qualify for the Prime grade.

Choice

Choice grade beef carcasses and wholesale cuts are moderately blocky and compact and moderately thick-fleshed throughout. Loins and ribs are moderately thick and full, and the rounds are moderately plump. The chucks are moderately thick and the necks and shanks are moderately short. The fat covering of beef within the grade will vary within moderate limits depending on evidences of the maturity attained by the animal from which it was produced. Carcasses whose chine bones are soft and red and which terminate in soft, pearly white cartilages may have a slightly thin covering of exterior fat and a moderate quantity of interior fat. In such beef there will be a modest protrusion of fat between the chine bones and moderate overflow fat and feathering. Carcasses whose chine bones are tinged with white and which terminate in cartilages in which ossification is plainly evident will usually possess a moderately thick exterior fat covering that extends over nearly the entire surface of the carcass and shall have fairly heavy deposits of interior fat. In such beef there will be a moderate protrusion of fat between the chine bones and moderately abundant overflow fat and feathering. Interior and exterior fats are fairly firm and brittle. Characteristics of the cut surface of the rib eye muscle will vary, depending on evidences of the maturity attained by the animal from which it was produced. In carcasses whose chine bones are soft and red and which terminate in soft, pearly white cartilages, the rib eye has a moderate amount of marbling and is usually slightly soft but fine in texture. In carcasses whose chine bones are tinged with white and which terminate in cartilages in which some ossification is evident, the rib eye has moderately abundant marbling and is usually moderately firm and fine in texture. The color of the muscle usually ranges from a light red to slightly dark red. It is usually uniform and bright in color but may be slightly two-toned or slightly shady.

Carcasses showing evidences of the maximum maturity permitted in the Choice grade have chine bones which are tinged with white and cartilages on the end of the chine bones which are partially ossified. However, the carcasses must also be at least moderately symmetrical and uniform in contour and the rib eye muscle must be fine in texture.

muscle will also vary, depending on the evidences of maturity attained by the animal from which it was produced. In carcasses whose chine bones are soft and red and which terminate in soft, pearly white cartilages, the rib eye muscle is somewhat soft and watery but fine in texture and will be practically devoid of marbling. In carcasses whose chine bones are tinged with white and which terminate in cartilages in which some ossification is evident, the rib eye muscle is moderately soft and moderately fine in texture and has a slight amount of marbling. The lean will usually vary from a light red to a slightly dark red in color but may be slightly two-toned or shady.

Carcasses showing evidence of maximum maturity permitted in the Standard grade may have chine bones tinged with white and the cartilages on the end of the chine bones may be moderately ossified. Carcasses must also be at least moderately symmetrical and uniform in contour and the rib eye muscle must be at least moderately fine in texture.

Young, red-boned, lightweight carcasses with conformation equivalent to at least the midpoint of the grade as defined above may be devoid of marbling and qualify for the Standard grade. However, carcasses which show similar evidence of maturity but which have conformation equivalent to the upper third of the Utility grade are practically devoid of marbling. Carcasses near the maximum limit for maturity with conformation equivalent to at least the midpoint of the grade as defined above may qualify for the Standard grade with traces of marbling; however, carcasses with similar evidences of maturity but which have conformation equivalent to the upper third of the Utility grade are required to have a slight amount of marbling.

Commercial

Commercial grade beef carcasses and wholesale cuts are restricted to those with evidences of more advanced maturity than permitted in the Good and Standard grades. Such carcasses are slightly thick fleshed but rather rough and irregular in contour. Rounds are slightly flat and tapering. Loins are moderately wide but slightly sunken and the hips are rather prominent. Ribs tend to be slightly thick and full. Chucks are slightly thin, and plates and briskets are wide and "spready." The necks and shanks are slightly long and thin. The fatness of beef within this grade will be variable, depending on the evidences of maturity attained by the animal from which it was produced. Car-

some ossification is evident will have a *modest amount* of marbling and the muscle is usually slightly soft but moderately fine in texture. The muscle will usually vary from a light red to a slightly dark red in color but may be *slightly two-toned* or slightly shady.

Carcasses showing evidence of the maximum maturity permitted in the Good grade may have chine bones *tinged with* white and the cartilages on the end of the chine bones may be moderately ossified. Carcasses must also be at least moderately symmetrical and uniform in contour and the rib eye muscle *must* be at least moderately fine in texture.

Red-boned, lightweight carcasses which have traces of marbling may meet the minimum requirements for Good provided they have conformation equivalent to at least the midpoint of the grade. However, carcasses which show similar evidences of maturity but which are slightly rangy and angular are required to show a slight amount of marbling. Carcasses near the maximum limit for maturity with conformation equivalent to at least the midpoint of this grade may qualify for Good with a small amount of marbling whereas carcasses which show similar evidences of maturity and which are slightly rangy and angular are required to have a modest amount of marbling.

Standard

Standard grade beef carcasses and wholesale cuts are rangy, angular, and slightly thin fleshed throughout. Loins and ribs tend to be flat and are slightly thin fleshed. The rounds are moderately flat and tapering. Chucks are slightly flat and thinly fleshed. The fat covering of beef within this grade will vary slightly depending on the evidences of maturity of the cattle from which it was produced. Carcasses whose chine bones are soft and red and which terminate in soft pearly white cartilages have only a thin covering of external fat over the loins and ribs, practically no protrusion of fat between the chine bones, and very scanty quantities of overflow fat and feathering. Carcasses whose chine bones are tinged with white and which terminate in cartilages in which some ossification is evident will have a slightly thin covering of fat over the loins and ribs which partially covers the outsides of the rounds and chucks. In such beef there is a very slight protrusion of fat between the chine bones and a small amount of overflow fat and feathering. The fat is moderately soft. Characteristics of the cut surface of the rib eye

Utility

Utility grade beef carcasses and wholesale cuts may be decidedly rangy, angular, and irregular in conformation. The fleshing is usually thin. The loins and ribs are flat and thinly fleshed. The rounds are long, flat, and tapering. The chucks are flat and thinly fleshed. The neck and shanks are long and tapering. The hip and shoulder joints are prominent. The degree of fat covering varies from very thin in beef produced from young steers and heifers, to a slightly thick covering that may be somewhat uneven in beef produced from cattle that are more or less advanced in age. The quantity of interior fat varies from very little in beef that is produced from young and immature steers and heifers, to a moderate quantity in that produced from mature cattle. The fat is usually soft. The cut surface of the lean muscle is usually soft and watery in the beef produced from younger cattle, but in that produced from more mature cattle it is usually fairly firm but coarse. The beef in this grade will show practically no marbling except in that produced from aged cattle, which may show a little marbling in the thicker cuts. The color may be two-toned or shady, and usually ranges from a light red to a very dark red. The bone is usually hard and white.

The Utility grade of beef may be produced from steers, heifers, or cows.

Cutter

Cutter grade beef carcasses and wholesale cuts may be very rangy, angular, and irregular in conformation and very thinly fleshed throughout. The loins and ribs are very flat, thin, and shallow. The rounds are very long, flat, and tapering. The chucks are very flat, thin and shallow. The neck and shanks are very long and tapering. The hip and shoulder joints are very prominent. The degree of exterior fat covering may vary from a very thin covering that is confined almost entirely to the ribs and loins in the beef produced from younger cattle to a thin, more extensive covering in the beef produced from mature cattle. The interior fat is confined largely to the pelvic cavity and the kidney and may vary from a very small quantity, if any, in these parts in beef produced from younger cattle to a limited quantity in that produced from mature cattle. The cut surface of the lean muscle shows no marbling, is coarse, and is usually soft and watery. The color may be two-toned or shady, and usually ranges

casses which only slightly exceed the minimum maturity permitted will have a slightly thick covering of external fat, a small amount of fat protrusion between the chine bones, and a moderate amount of overflow fat and feathering. Carcasses that have hard, white chine bones which terminate in nearly completely ossified cartilages will have a moderately thick exterior fat covering, a moderate protrusion of fat between the chine bones, and moderately abundant overflow fat and feathering. In beef of this grade, particularly those more advanced in maturity, the external fat covering will be considerably thicker over the loins and ribs than over the rounds and chucks, and may frequently be patchy or wasty. The fat is firm. In carcasses which only slightly exceed the minimum maturity permitted the cut surface of the rib eye muscle will be moderately firm and slightly coarse in texture and will have a moderate amount of marbling. In carcasses that have hard, white chine bones that terminate in almost completely ossified cartilages the rib eye muscle will be firm but coarse in texture, and the marbling will be moderately abundant but also rather coarse and prominent. The lean will usually vary from slightly dark red to dark red in color but may be two-toned or shady.

Regardless of the extent to which other grade factors may exceed the minimum requirements for the grade, carcasses which only slightly exceed the minimum maturity permitted are required to have a small amount of marbling, and carcasses whose chine bones are hard and white and which terminate in nearly completely ossified cartilages are required to have at least a moderate amount of marbling. Carcasses which only slightly exceed the minimum maturity permitted and which are slightly thin fleshed and rather rangy and angular may meet the minimum requirements for the grade provided they have a modest amount of marbling, and carcasses with similar conformation which have hard, white chine bones that terminate in almost completely ossified cartilages may meet the minimum requirements for the grade provided they have slightly abundant marbling.

Carcasses whose conformation and evidences of quality only slightly exceed the minimum requirements for the grade are not eligible for the Commercial grade if they are excessively patchy or uneven in distribution of external fat.

Young lambs—a slightly dark pink color of inside flank muscles.
Mature lambs—a light red color of inside flank muscle.
Young lambs—modest amount of feathering between the ribs.
Mature lambs—moderate amount of feathering between the ribs.
Young lambs—small quantity of fat streaking on inside flank muscle.
Mature lambs—modest amount of fat streaking on inside flank muscle.

The lean flesh and the exterior finish should be relatively firm and the flanks moderately full and firm. The minimum external fat requirements for Prime is at least a very thin covering of external fat over the top of the shoulders and the outsides of the upper parts of the legs, and the back must have at least a thin covering of fat; that is, the muscles of the back may be no more than barely visible through the fat.

A development of quality which is superior to that specified as minimum for Prime may compensate, on an equal basis, for a development of conformation which is inferior to that specified as minimum for Prime. For example, a carcass which has evidence of quality equivalent to the mid-point of the Prime grade may have conformation equivalent to the mid-point of the Choice grade and remain eligible for Prime. However, in no instance may a carcass be graded Prime which has a conformation inferior to that specified as minimum for the Choice grade.

Choice

To minimize repetition, substitute the word "slightly" for "moderately" in the description of the Prime grade to this point —A carcass which has conformation equivalent to at least the mid-point of the Choice grade may have quality equivalent to the minimum for the upper third of the Good grade and remain eligible for Choice. Superior quality may compensate on an equal basis for a conformation which is inferior to that specified as minimum for Choice. For example, Top Choice conformation in a carcass with Top Good quality makes it eligible for the Choice grade. However, in no instance may a carcass be graded Choice which has a conformation inferior to that specified for the Good grade.

from a slightly dark red to a very dark red. The bone is usually hard and white.

The Cutter grade of beef may be produced from steers, heifers, and cows. That produced from cows constitutes a relatively large percentage of the beef eligible for this grade.

Canner

Canner grade beef carcasses and wholesale cuts are extremely rangy, angular, and irregular in conformation and extremely thinly fleshed throughout. All cuts are extremely thinly fleshed. Loins and ribs are extremely thin, flat, and shallow. The rounds are very long, flat, and tapering, and the chucks are extremely thin, flat, and shallow. The neck and shanks are extremely long, and the hips and shoulder joints are extremely tapering. Beef of this grade is practically devoid of both interior and exterior fat. The outside surface usually has a very dark appearance. The cut surface of the lean muscle is usually coarse, and is soft and watery in appearance. It shows no marbling. The color may be two-toned or shady, and usually ranges from a moderately dark red to an extremely dark red or brownish black. The bones are nearly always hard and white.

A very large percentage of the beef of the canner grade is produced from mature cows that are somewhat advanced in age.

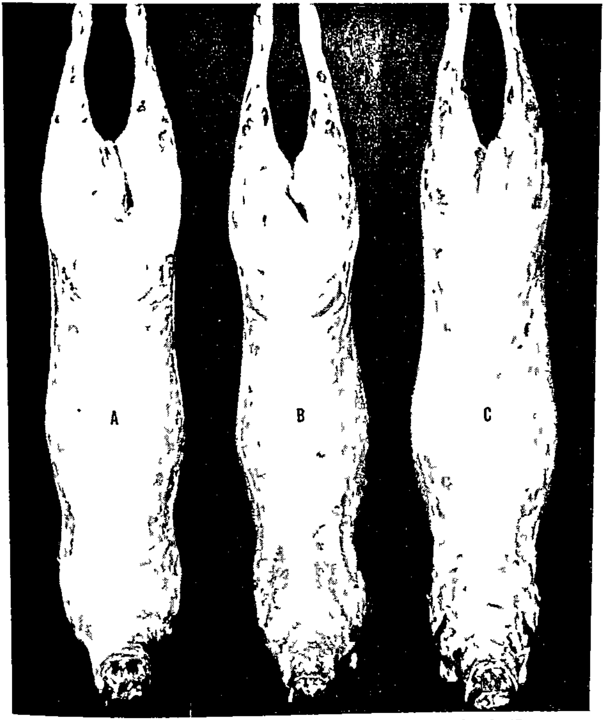
SPECIFICATIONS FOR OFFICIAL UNITED STATES STANDARDS FOR GRADES OF LAMB CARCASSES (MARCH, 1960)

Prime

Carcasses possessing the minimum qualifications for the Prime grade are moderately wide and thick in relation to their length and have moderately wide and thick backs; moderately plump and full legs; and moderately thick and full shoulders.

Requirements for quantities of interior fats and for firmness of lean and fat vary with changes in maturity.

Young lambs—moderately narrow, slightly flat rib bones.
Mature lambs—slightly wide, moderately flat rib bones.
Young lambs—moderately red and moist and porous break joints.
Mature lambs—slightly red but slightly dry and hard break joints.



Prime Choice Good (L)

Fig. 20 2—

YEARLING AND MUTTON CARCASSES

The grades are Prime, Choice, Good, Utility, and Cull for yearlings, and Choice, Good, Utility, and Cull for mutton carcasses.

Revised Veal and Calf Grades

Changes in standards for grades of veal and calf carcasses made effective March 10, 1951, coincide with revisions made in

Good

Lamb carcasses possessing minimum qualifications for the Good grade are moderately narrow in relation to their length and have slightly thin, tapering legs, and slightly narrow, thin backs and shoulders. The young lambs have traces of feathering between the ribs, but no fat streaking on the inside flank muscle. Their lean flesh and exterior finish are slightly firm, and their flanks are slightly thin and soft.

The more mature lambs have a slight amount of feathering, and traces of fat streaking on the inside flank muscles. Also, their lean flesh and external finish tend to be moderately firm, and their flanks tend to be slightly full and firm.

A carcass which has conformation equivalent to the midpoint of the Good grade and quality equivalent to the minimum for the upper one-third of the Utility grade is eligible for Good. Also, a quality which is superior to that specified as the minimum for the Good grade may compensate for a conformation which is inferior to that specified as minimum for Good on the basis of one-half grade of superior quality for one-third grade of deficient conformation. However, in no instance may a carcass be graded Good which has a conformation inferior to that specified as minimum for the Utility grade.

Utility

Lamb carcasses of this grade are very angular and very narrow in relation to their length, and have thin, slightly concave legs, very narrow and sunken backs, and narrow, sharp shoulders. Hips and shoulder joints are plainly visible. Although evidences of quality vary slightly with changes in maturity, the differences are very small. The lean of the inside flank and between the ribs is dark red in color and the carcass is soft and slightly watery.

A carcass with Average Utility conformation and Top Cull quality qualifies for the Utility grade. Also, quality superior to that specified as minimum for the Utility grade may compensate for conformation which is inferior to that specified as minimum for Utility on the basis of one-half grade of superior quality for *one-third grade of deficient conformation.*

Cull

You know them when you see them.

casses. Medium grade carcasses have a lower degree of finish and a resulting higher ratio of lean to fat than U. S. No. 1, U. S. No. 2, and U. S. No. 3 grades; however, Medium grade carcasses are underfinished and lack the quality characteristics associated with acceptable palatability as evidenced by a lack of firmness and indications of little or no marbling in the lean. Cull grade carcasses are decidedly underfinished and the pork is soft and watery with no visible marbling. Only carcasses with the firmness appropriate to their degree of finish are included under the standards described in this part. However, carcasses which are typically soft or oily as a result of feeds producing soft or oily fat may be graded in accordance with these standards provided they are specially identified as soft or oily along with the grade.

Measurements of average back fat thickness in relation to carcass weight or length are closely related to yields of cuts and the quality of the cuts. The following table of measurements provides an objective guide in determining the barrow, gilt, and sow carcass grades.

The standards for grades of barrow and gilt carcasses include carcass measurements and descriptions of carcass characteristics which indicate the lean and fat yields and imply the

Weight and Measurement Guides to Grades for Barrow, Gilt, and Sow Carcasses.

Carcass Weight or Carcass Length[1]	Average Back Fat Thickness (Inches)[2] by Grade				
	U.S. No. 1	U.S. No. 2	U.S No 3	Medium	Cull
	Inches	Inches	Inches	Inches	Inches
Under 120 pounds or under 27 inches	1 2 to 1 5	1 5 to 1 8	1 8 or more	0 9 to 1 2	Less than 0 9
120 to 164 pounds or 27 to 29 9 inches	1 3 to 1 6	1 6 to 1 9	1 9 or more	1 0 to 1 3	Less than 1 0
165 to 209 pounds or 30 to 32 9 inches	1 4 to 1 7	1 7 to 2 0	2 0 or more	1 1 to 1 4	Less than 1 1
210 or more pounds or 33 or more inches	1 5 to 1 8	1 8 to 2 1	2 1 or more	1 2 to 1 5	Less than 1 2
Sow carcasses	1 5 to 1 9	1 9 to 2 3	2.3 or more	1 1 to 1 5	Less than 1 1

[1]Either carcass weight or length may be used with back fat thickness as a reliable guide to grade The table shows the normal length range for given weights In extreme cases where the use of length with back fat thickness indicates a different grade than by using weight, final grade is determined subjectively as provided in the standards Carcass weight is based on a chilled packer style carcass Carcass length is measured from the forward point of the aitchbone to the forward edge of the first rib

[2]Average of measurements made opposite the first and last ribs and last lumbar vertebra.

the live grades and (1) combine the former Choice and Prime grades under the name Prime, (2) rename the Good grade as Choice, (3) establish a new grade called Good which includes meat from the top half of the former Commercial grade, (4) continue the remainder of the Commercial grade as Commercial, and (5) leave the Utility and Cull grades unchanged.

A further revision was made in October, 1956, changing the grade name "Commercial" to "Standard" and making certain changes in the phrasing of the standards designed to facilitate their interpretations.

OFFICIAL UNITED STATES STANDARDS FOR GRADES OF PORK CARCASSES (BARROW AND GILT) (SOW)

Basis for Pork Carcass Standards

The standards for pork carcasses developed by the United States Department of Agriculture provide for segregation according to (a) class, as determined by the apparent sex condition of the animal at the time of slaughter, and (b) grade, which reflects quality of pork and the relative proportion of lean cuts to fat cuts in the carcass.

Pork Carcass Classes

The five classes of pork carcasses, comparable to the same five classes of slaughter hogs, are barrow, gilt, sow, stag, and boar carcasses.

Application of standards for grades of barrow and gilt carcasses

Differences in barrow and gilt carcasses due to sex condition are minor, and the grade standards are equally applicable for grading both classes.

Barrow and gilt carcasses are graded primarily on the basis of (1) differences in yields of lean cuts and of fat cuts, and (2) differences in quality of cuts. These factors vary rather uniformly and consistently from one grade to another. The U. S. No. 1 grade combines an optimum ratio of lean to fat with quality characteristics indicative of acceptable palatability. U. S. No. 2 and U. S. No. 3 grades have higher degrees of finish with resulting lower yields of lean cuts and higher yields of fat cuts than U. S. No. 1 grade. In addition, the cuts from U. S. No. 2 and U. S. No. 3 grades have more internal fat remaining after trimming of external fat than do the cuts from U. S. No. 1 grade car-

The flesh is firm. Both exterior and interior fats are firm, white, and of excellent quality. Carcasses with fat thickness typical of the thinner one-half of the U. S. No. 1 grade but with the firmness, quantity, and distribution of interior fats, and belly thickness typical of the Medium grade, shall be graded Medium. Carcasses with fat thickness typical of the fatter one-half of the U. S. No. 1 grade, but with the fat distribution, meatiness, and thickness and fullness of hams, loins, shoulders, and bellies typical of the U. S. No. 2 grade, shall be graded U. S. No. 2.

U. S. No. 2 Grade

Carcasses in this grade have a higher degree of finish than the minimum required for the production of acceptable quality cuts. Meatiness based on yield of lean cuts in relation to carcass weight is slightly low; yield of fat cuts is slightly high. The ratio of total lean and fat to bone is moderately high. Carcasses with the minimum finish for U. S. No. 2 grade are moderately wide and slightly short in relation to weight. The back and loins are full and thick, and appear fuller near the edges than at the center. Hams are usually thick, plump, and smooth, and are moderately full in the lower part toward the hocks. Bellies are moderately thick, smooth, slightly short, and rather uniform in thickness; the belly pocket is moderately thick. Shoulders are moderately thick and full, but usually blend smoothly into the sides. The carcass is well-balanced and smooth with rather uniform development of the various parts. There are slightly large quantities of interior fat in the region of the pelvis, a slightly thick and moderately extensive layer of fat lining the inside surface of the ribs, and moderate feathering. The flesh is firm. Both exterior and interior fats are firm, white, and of excellent quality. Carcasses with fat thickness typical of the thinner one-half of the U. S. No. 2 grade, but with the fat distribution, meatiness, and thickness and fullness of hams, loins, shoulders, and bellies typical of the U. S. No. 1 grade, shall be graded U. S. No. 1. Carcasses with fat thickness typical of the fatter one-half of the U. S. No. 2 grade, but with the fat distribution, meatiness, and thickness and fullness of hams, loins, shoulders, and bellies typical of the U. S. No. 3 grade, shall be graded U. S. No. 3.

U. S. No. 3 Grade

Carcasses in this grade have a decidedly higher degree of finish than the minimum required for the production of accep-

quality of meat typical of the minimum degree of finish of each grade. Visual estimates of fat thickness normally alleviate necessity for measuring carcasses in the grading operation. In addition to the measurement guides to grade differences, the standards also provide the basis for consideration of other characteristics. While carcass measurements furnish a reliable general guide to grade, the final grade of borderline carcasses may vary from that indicated by measurements due to consideration of other characteristics such as visual evidences of quality; meatiness; conformation of hams, loins, bellies, and shoulders; and fat distribution. However, application of these additional factors is limited to borderline carcasses, and in no case may the final grade be more than one-half of the width of a grade different than that indicated by carcass measurements. The standards describe carcasses typical of each grade, and no attempt is made to describe the nearly limitless number of combinations of characteristics that may qualify a carcass for a particular grade.

SPECIFICATIONS FOR OFFICIAL UNITED STATES STANDARDS FOR GRADES OF BARROW AND GILT CARCASSES

U. S. No. 1 Grade

Carcasses in this grade have near the minimum degree of finish required for the production of acceptable quality cuts. Meatiness based on yield of lean cuts in relation to carcass weight is slightly high; yield of fat cuts is slightly low. The ratio of total lean and fat to bone is slightly high. Carcasses possessing the minimum finish for U. S. No. 1 grade are slightly wide and moderately long in relation to weight. The back and loins are moderately long in relation to weight. The back and loins are moderately full and thick, with a well-rounded appearance. Hams are usually moderately thick, plump, and smooth and are slightly full in the lower part toward the hocks. Bellies are moderately long and smooth, slightly thick, and moderately uniform in thickness; the belly pocket is slightly thick. Shoulders are slightly thick and full but usually blend smoothly into the sides. The carcass is moderately well-balanced and smooth, with moderately uniform development of the various parts. There are moderate quantities of interior fat in the region of the pelvis, a slightly thin but fairly extensive layer of fat lining the inside surface of the ribs, and a slightly small quantity of feathering.

of the Medium grade, but with the firmness, quantity, and distribution of interior fats, and belly thickness typical of the U. S. No. 1 grade, shall be graded U. S. No. 1. Carcasses with the fat thickness typical of the thinner one-half of the Medium grade, but with the firmness, quantity, and distribution of interior fats, and belly thickness typical of the Cull grade, shall be graded Cull.

Cull Grade

Carcasses in this grade have a considerably lower degree of finish than the minimum required for the production of acceptable quality cuts, and most cuts are suitable only for processing. Yield of lean cuts in relation to carcass weight is high; yield of fat cuts is low. The ratio of total lean and fat to bone is low. Carcasses with the degree of finish typical of the Cull grade are narrow and long in relation to weight. The back and loins are thin and decidedly lacking in fullness, and have a definite slope away from the center toward the sides. Hams are usually thin, flat, and wrinkled, and show a definite taper toward the hocks. Bellies are very long, thin, wrinkled, and uneven in thickness; the belly pocket is very thin. Shoulders are thin and flat, but often prominent at the junction with the sides. The carcass is uneven and rough with irregular development of the various parts. There are only small quantities of interior fat in the region of the pelvis, and little or no fat as lining on the inside surface of the ribs or as feathering between the ribs. Both exterior and interior fats are soft, creamy white to white, and of low quality. The flesh is soft and watery, and has no evidence of marbling. Carcasses with nearly maximum fat thickness for the Cull grade, but with the firmness, quantity, and distribution of interior fats, and belly thickness typical of the Medium grade, shall be graded Medium.

GRADE STANDARDS FOR SOW CARCASSES

The establishment of United States standards for grades of slaughter sows and sow carcasses became effective Sept. 1, 1956.

The grades are based on differences in yields of lean cuts and fat cuts and differences in quality of pork. In developing the standards, sow carcass data were studied to establish relationships between measurements and carcass differences important in grading. As a result these standards include average back

table quality cuts. Meatiness based on yield of lean cuts in relation to carcass weight is low; yield of fat cuts is high. The ratio of total lean and fat to bone is high. Carcasses with the minimum finish for U. S. No. 3 are wide and short in relation to weight. The back and loins are very full and thick, and appear especially full near the edges. Hams are usually thick, very plump, and smooth, and are full in the lower part toward the hocks. Bellies are short, thick, smooth, and uniform in thickness; the belly pocket is thick. Shoulders are thick and full but usually blend smoothly into the sides. The carcass is well-balanced and smooth with uniform development of the various parts. There are large quantities of interior fat in the region of the pelvis, a moderately thick and extensive layer of fat lining the inside surface of the ribs, and slightly abundant feathering. The flesh is firm. Both exterior and interior fats are firm, white, and of excellent quality. Carcasses with nearly minimum fat thickness for the U. S. No. 3 grade, but with the fat distribution, meatiness, and thickness and fullness of hams, loins, shoulders, and bellies typical of the U. S. No. 2 grade, shall be graded U. S. No. 2.

Medium Grade

Carcasses in this grade have a lower degree of finish than the minimum required for the production of acceptable quality cuts. Yield of lean cuts in relation to carcass weight is moderately high; yield of fat cuts is moderately low. The ratio of total lean and fat to bone is moderately low. Carcasses with the minimum finish for Medium grade are rather narrow and long in relation to weight. The back and loins are rather thin and deficient in fullness, and slope away from the center toward the sides. Hams are usually slightly thin and lacking in plumpness, and taper slightly toward the hocks. Bellies are moderately thin, long, slightly wrinkled, and moderately uneven in thickness; the belly pocket is moderately thin. Shoulders tend to be thin and flat but often show prominence at the junction with the sides. The carcass tends to be uneven and rough with slightly irregular development of the various parts. There are slightly small quantities of interior fat in the region of the pelvis, a scanty and incomplete layer of fat lining the inside surface of the ribs, and only a small quantity of feathering. Both exterior and interior fats are moderately soft, white to creamy white, and of low quality. The flesh is moderately soft and has little evidence of marbling. Carcasses with the fat thickness typical of the fatter one-half

During the year 1959 there were 400 Federal Meat Graders listed under G.S.-9, the salary range being from $6435 to $7425 per annum, with a yearly salary promotion. It requires six years to reach maximum salary. Every grader's work is identified by code in his grade stamp by means of a letter of the alphabet.

Cost of the Grading Service

(a) The hourly rate for grading service shall be $6.00 per hour.

(b) Fees for grading performed on a weekly contract basis shall be $240 per calendar week (less any allowable credits), to cover up to 40 hours of weekly grading service, and at the regular rate prescribed in paragraph (a) of this section for grading time in excess of 34 hours per week.

(c) When grading service is requested at a place so distant from a grader's official headquarters that a total of 1 hour or more is required for the grader to travel to and return from such place, the fee for grading service at such place shall equal the usual fee calculated at the applicable rates prescribed in paragraph (a) or (b) of this section, as the case may be, plus a mileage fee of 8c per mile for such travel and return.

(d) When grading service is requested at any place outside the area of a grader's official station, the fee for such grading service shall equal the usual fee calculated at the applicable rates prescribed in paragraph (a) or (b) of this section, as the case may be, plus any mileage chargeable under paragraph (c) of this section, and a per diem charge at the rate of $12.00 per day. Additional portions of days are computed to the nearest quarter of a day.

The Stamp Ink Is Harmless

The ink used in stamping meat, whether it is the inspection stamp or the grade stamp, is made from a vegetable dye that is absolutely harmless and need not be trimmed off the meat.

Formula for Making Stamp Ink

Water	3.5 oz.	Cane sugar	1.0 oz.
Grain alcohol	2.5 oz.	Methyl violet	.1 oz.

fat thickness measurements as objective guides to grade. These principles are similar to those which have received widespread acceptance in the standards for barrows and gilts, adopted in 1952. (See preceding table "Weight and Measurement Guides to Grades for Barrow, Gilt, and Sow Carcasses.")

The five grades for sows and sow carcasses are U. S. No. 1, U. S. No. 2, U. S. No. 3, Medium, and Cull. These are the same designations used for grades of barrows and gilts, and the general characteristics of each grade also are similar. The U. S. No. 1 grade includes sows and carcasses with about the minimum finish required to produce pork cuts of acceptable palatability. The U. S. No. 2 and U. S. No. 3 grades represent overfinish with resulting lower yields of lean and higher yields of fat. Medium and Cull are underfinished grades producing pork with low palatability.

APPLYING THE GRADE STAMP TO BEEF, LAMB, AND VEAL

The meat grader inspects each carcass, and if on the basis of its conformation (general body contour and shape), finish (internal and external fat covering), and quality (firmness of the fat, color of the lean and bone, overflow fat on the ribs, feathering between the ribs, and freedom from bruises) finds that it meets the specifications of a certain grade, he uses a roller stamp to leave the grade imprint on the entire length of the carcass and at such other points that all the principal retail cuts will bear the grade label.

THE MEAT GRADER

Government meat graders are appointed from a list of eligibles submitted by the Civil Service Commission. To qualify, a candidate must have had at least four years of suitable practical experience in wholesale meat marketing and grading. A maximum of three years of appropriate college training can be substituted for practical experience. Before being given a permanent appointment as grader, he must serve a probationary period of one year during which time he is given careful training in the application of standards and his work is reviewed very carefully by a grading supervisor to ascertain his ability to do the job in strict conformance with the Federal standards. The government takes precautions to obtain competent men of high integrity.

XXI.

CARCASS GRADING AT COLLEGIATE AND NONCOLLEGIATE LEVELS

Intercollegiate Meat Judging Contests were inaugurated and sponsored by the National Livestock and Meat Board in the fall of 1926 when the first contest of its kind was held in connection with the International Livestock Exposition, Chicago, Illinois. It now sponsors similar contests at Kansas City, Missouri; Fort Worth, Texas; Baltimore, Maryland; and Portland, Oregon; concurrent with the Livestock Expositions held at those places.

The success of Intercollegiate Livestock Judging Contests, and the fact that more agricultural colleges were teaching meat courses, prompted Mr. R. C. Pollock, then general manager of the Board, to get intercollegiate meat judging on its way. Ten teams competed that first year as compared to 26 teams in 1960. It has accomplished what it set out to do, which is to give college students who met the eligibility rules set up by rules committee, the opportunity to put to a test the meat knowledge they acquired in their respective institutions and to gain a wider knowledge of the meats industry. As was to be expected, it did more than that. Student met student, and they in turn met men in the industry. The Meat Industry (packers) became interested in these young men, with the result that many college trained men are now holding responsible positions with them.

THE SET-UP

The rules and regulations governing intercollegiate meat judging contests are undergoing constant change. They are briefly as follows:

Any college or university having adequate instruction in meats is eligible to enter a team, which is composed of three members, men or women, either or both. The eligibility rules of the Collegiate Livestock Judging Contest apply. There is no entrance fee, and all blank forms, placing, and reason cards are pro-

PACKERS AND STOCKYARDS ACT

The purpose of the Packers and Stockyards Act, passed in 1921, is to provide for uniform and reasonable rates and practices, and to prevent unfair, unjustly discriminatory, or deceptive practices. This is particularly helpful to farmers who are unable to supervise the sale of their livestock personally. Federal supervision under the act extends to trade practices, commissions, feed and yardage rate charges, weighing and scale testing, and to other services rendered at the posted stockyards. Millions of dollars are saved livestock producers annually through this supervision. This act was amended in 1935 to bring within its scope certain poultry markets designated by the Secretary of Agriculture.

An amendment to the Packers and Stock Yard Act in 1957 made the act applicable to all public markets, market agencies, and dealers handling livestock in interstate commerce.

Time

Fifteen minutes are allowed for note taking and placing each of the five reason classes. Contestants will stand back from all classes except grading classes, to observe general appearance. Twelve minutes are allowed for judging each of the four nonreason classes. A two-minute warning is given before placing cards are collected.

Twenty-four minutes are allotted for grading 20 beef carcasses of which the carcasses numbered 1 to 15 will be steer and heifer carcasses and carcasses numbered 15 to 20 will be cow carcasses.

Twelve minutes are allotted for grading 10 lamb carcasses. Because meat judging requires most of the skills of a meat grader and since a skilled meat grader is a good judge of meat, it is more practical and logical to learn carcass grading first.

BEEF AND LAMB CARCASS GRADING

Beef

Beef carcass grading is the act of determining, by visual examination of a carcass, the features and qualities that make it eligible to be classified under one of the Federal Grades. It also involves the ability to identify sex since steer, heifer, cow, bull, and stag carcasses have physical characteristics for which separate grade standards have been provided.

Meat packers segregate carcasses by sex, so in most instances a carcass grader is working on one particular sex at a time. This is not always the case in contest judging where mixing of the sexes may be practiced. (Since it is no longer a feature of intercollegiate beef carcass grading, sex identification will be discussed in Chapter XXIII under Meat Identification.)

A full grade designation is not acceptable in contest grading since it would involve the contestants in too many ties. Designation of the particular segment of the grade for which it qualifies such as High (top), Average (middle), or Low (minimum) is required. This makes it very important that, as a first step in learning to grade, one study rather closely the specifications set up for each grade (see Chapter XX). These make dull reading unless one is really interested and willing to learn. It is suggested by the author that it be handled by having one member of the group read the specifications slowly as the instructor points to

vided by the management. The contestant must supply the pencil or pen and ink, whichever he chooses.

Each year the winning team is awarded the custody of a perpetual trophy which must be won three times for permanent possession. A plaque is awarded as the permanent property of the winning team, and place ribbons awarded to each of the ten high teams.

An appropriate emblem is awarded annually to the highest ranking individual in total points and to the highest ranking individual in each of the major classes—Beef, Pork, Lamb, Beef carcass grading, and Lamb carcass grading. There are ribbons for the ten highest contestants in total points, and five ribbons for the highest contestants in grading.

Conduct of Contestants

The contestants must abide by the regulations and may be disqualified by the squad leader upon warning and continued violation. The rules forbid talking among contestants, the use of gimmicks such as grade guide cards, photographs, or measuring rulers; the handling of beef and pork cuts or touching the rib eye in the carcass grading class. This has been made necessary by the large number of contestants working over the limited classes. Use the eye, not the hand.

The following are the classes that will confront each contestant and which are to be placed on their merits, ignoring bruises or faulty trim or workmanship. Each class to be judged consists of four specimens.

Class	Placing	Reasons
Beef carcasses	50	50
Beef carcasses	50	—
Beef cuts	50	50
Beef cuts	50	—
Pork carcasses	50	50
Pork carcasses	50	—
Pork cuts	50	50
Lamb carcasses	50	50
Lamb carcasses	50	—
Beef carcass grading (20)	200	
Score per carcass		
Correct ... 10 points		
⅓ grade off ... 8 points		
⅔ grade off ... 5 points		
Full grade off ... 0 points		
Lamb carcass grading (10)	100	
	750	250
(10 points per carcass scoring, same as for beef carcasses)—Grand Total	1000 points	

Fig 21 2—A rib from a 22 month old prize steer A very desirable Prime grade rib because of its meatiness with even external fat covering and abundant coarse marbling

ing away on the bolus of meat The best set of teeth are defeated when it comes to grinding the connective tissues Don't condemn such meat, because it can be made tender, but not without giving it special treatment Therefore, if one does not first determine the age of the carcass, no beginning has been made

the specimen carcass representative of the grade. Call it an obituary if you like.

One will read or be told that there are four important things to consider when grading beef, lamb, pork, or veal. These are (1) age (stage of maturity), (2) quality, (3) conformation, and (4) finish (external fat covering and body cavity fat).

Why begin with age? Because meat fibers from older animals are less tender. The evidences of quality may be as prominent in the carcass of a 4-year-old heifer or steer carcass as in a twenty-month-old steer carcass, but what one cannot see too plainly, when looking at a cross section of the rib eye muscle, is the difference in the fiber. Connective tissue (collagen) increases in thickness with age. Each cell wall is made up of collagen; bundles of muscle cells are sheathed in collagen and entire muscles are wrapped in collagen. Broil a steak from this four-year-old and good teeth will pass between the fibrous-covered cells; the flavor will probably be high, but one must keep chew-

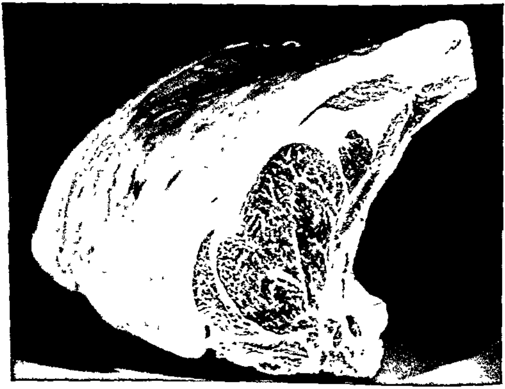


Fig. 21.1—A rib from a 30-month-old prize steer. The unusual feature is the high degree of marbling (too much) for the moderate external covering. On a cooking test, the steaks had a tallowy taste and the roast floated in grease. What was left had excellent flavor, and was tender and juicy.

Fig. 21.3—Average Good grade. This carcass graded high Standard in conformation. Bottom—Modest amount of marbling and large size rib eye. Center—No marbling on the flank steak, slight amount on lower flank area. Top—Modest feathering with some fat covering over last four ribs. Maturity (b) on grade guide.

How is age determined? By looking at the backbone and the ribs. In young animals the ribs are more oval and show a red streak on the rib, while older animals have a broad, flat rib that is white. The feather bones (spinus process) on the fore quarter are white, hard, and flinty, and the buttons on their tips become hard (ossified). If the carcass is from a young animal, these feather bones will be red and porous with buttons that are white and soft. The aitchbone in the rump of young animals will show a white cartilage where it was split. This bone must be sawed in an old animal. The sacrum (vertabrae in the sirloin area from the hip to the tail) is a solid, fused mass of five vertebrae in an old animal but each sacral vertebra is plainly visible in a young animal. Lastly, the flesh of old animals is darker and the fat may have more of a yellow tinge.

One of the perplexing problems faced by a beginner is determining the stage of maturity. A good slogan for this would be "Watch Your Buttons." To associate the state of maturity with marbling and conformation, refer to the "Beef Grade Guide." It is suggested that you retype it, paste it on a piece of cardboard, cover it with cellophane, and carry it in your pocket along with the "Pork Measurement Guide."

Take a Good Long Look at Quality

The student who participates in intercollegiate meat judging and grading has one advantage when grading beef carcasses that a professional grader does not have. The student does not have to look for the various indications of quality on the outside and inside of the carcass because one side of each carcass has been ribbed down, exposing the rib eye muscle. He does not have to *guess* as to the marbling, the color, the firmness, the texture, the size of the rib eye—it's all there in red and white.

Guess is not the word to use so let's say "opinionate." In your opinion, No. 1 carcass should be a higher quality because it has more marbling or fat streaks on the flank steak; more profuse fat covering over the lower flank area and skirt; is completely covered with fat in the rib area; has fat protruding between the feather bones; and has practically a white brisket showing. These conditions along with an over-all external fat covering give all the indications of a high degree of marbling. That is, for example, what we see and what the professional grader sees in that particular carcass. From experience, we know that a carcass

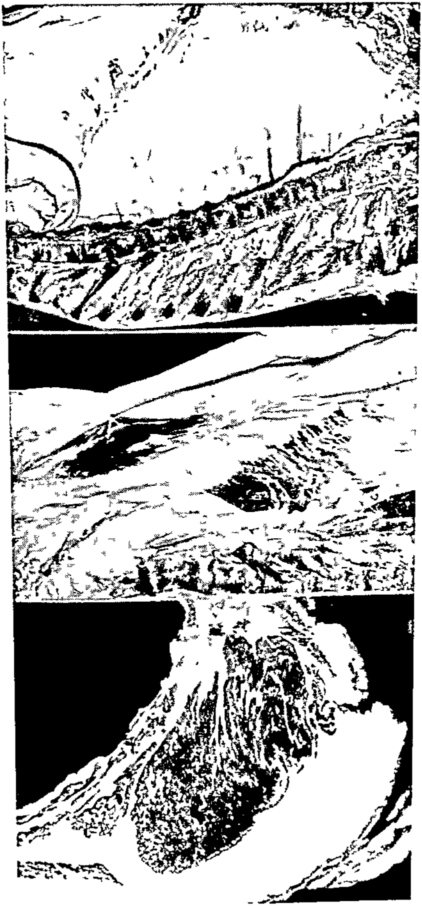


Fig. 21.5—Low Prime grade. This carcass graded mid Choice in conformation. Bottom—Moderately abundant marbling and normal size rib eye. Center—Marbling in flank steak and abundant fat streaks in lower flank. Top—Completely covered with overflow fat. Fat protruding between feather bones and white brisket showing. Maturity (a) on grade guide.

Fig. 21.4—Average Choice grade. This carcass graded Good in conformation. Bottom—Moderate amount of marbling. Good size rib eye. Center—Slight amount of marbling on flank steak and abundant fat deposit in lower flank area and over the skirt. Top—Covered under skirt area with overflow fat and abundant feathering. Maturity (a) on grade guide.

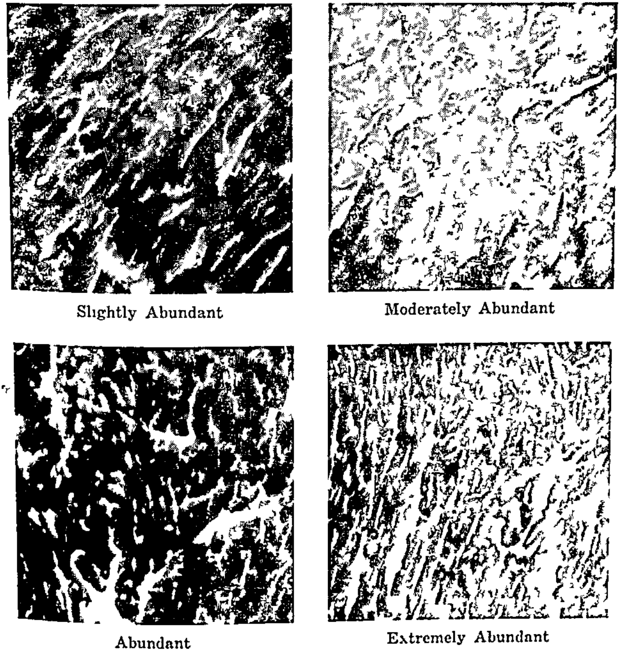


Fig. 21 6b—Degrees of Marbling, continued. (Courtesy, U S D A)

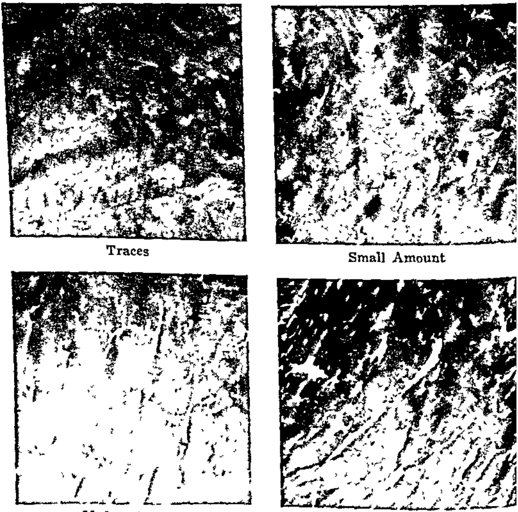
prints illustrating the different degrees of marbling found in this chapter can be used. There are several factors that must be considered other than marbling, such as the color and size of the rib eye. A dark colored rib eye is cause for degrading a carcass or cut. An exceptionally small eye covered with a heavy layer of fat *may* be cause for degrading, particularly if the carcass exhibits excessive external fat deposits Since color and size of rib eye are not a visible part of professional carcass grading (unribbed beef), care must be exercised in determining the amount of the cut to be made in the grade (1/3 to 2/3 of a grade).

with those characteristics is well marbled, sufficiently so to go Prime. But with the rib eye exposed, this analysis is unnecessary.

Degrees of Marbling

Did someone by chance ask—why don't they rib down all beef carcasses for the grader? The brief answer is, (1) too much handling would be required, (2) ribbed carcasses do not nest well, (3) ribbed carcasses are more difficult to move from one cooler to another, and (4) the rib eye darkens upon too long exposure.

Getting back to that exposed rib eye: determine from the degree of marbling that is evident, the grade standard to which it conforms. Here is where the "Beef Grade Guide" and the



Traces — Small Amount

Modest Amount — Moderate Amount

Fig. 21.6a—Degrees of Marbling (Courtesy, U.S.D.A.)

Choice, Good, Standard, Commercial, or Utility. In other words, does the conformation meet the specifications of form or shape and meatiness set up for a particular grade?

Fig. 21.8—Choice conformation. Good conformation.

Conformation and Finish

Having determined the stage of maturity and the degree of marbling, our next problem is to determine whether the form or shape (conformation) of the carcass can be classified as Prime,

Fig. 21.7—Prime conformation.

Fig. 21.9—Prime beef carcass showing excessive external fat covering over the rump, loin edge, and shoulder.

Fig 21 10—Applying the grade stamp

A study of the "Beef Grade Guide" shows that conformation is overlapping. For example, a carcass that is average Good or better in conformation but is young, with only a moderate amount of marbling can grade average Choice. On the other hand, if that same carcass is approaching maximum maturity, it must have the abundant marbling required by the Prime grade. Stated another way, the stage of maturity must be compensated or made up by a higher degree of marbling, and marbling has a 2 to 1 edge over conformation in the top three grades. This is due to the fact that people who buy quality meats, buy them for that reason. Those who buy the lower grades are looking for quantity regardless of quality. Therefore in the Standard, Commercial, and Utility grades, conformation and quality have equal value.

External fat covering (finish) is important in several respects. If it is firm and dry, it has quality and adds to the appearance of the carcass. If it is soft and oily, it lacks the quality sought in fat, causes the meat to reflect that softness, and may give the carcass a dull appearance.

Always degrade for soft, oily fat. The smoothness of external finish is important moneywise. Heavy deposits of fat over the rump, loin edge, and shoulder give the carcass a rough appearance and is described as gobby or wasty. This condition is usually associated with a heavy kidney and an excessive amount of cod and pelvic fat. If the size of the rib eye muscle is normal, grade according to quality and conformation; do not degrade for excessive waste fat. On the other hand, if the rib eye is below normal in size, and the bark (fat) over the rib is excessively thick, along with gobbiness, degrade ⅓ to a full grade depending upon the degree. Remember that a carcass must have a buyer, the buyer expects the grade to represent the quality for which the grade stands, plus a respectable percentage of salable meat. He can buy a barrel of tallow much cheaper, and the same goes for a barrel of bones.

The Federal meat grader or the packer grader weigh all the factors that have been discussed, decide upon the grade and make an identifying mark with a stamp designating the grade; xxx for Prime, xx for Choice, etc. After the grading task is ended, the grader or his assistant applies the ribbon grade stamp over the entire length of the carcass with a roller. That is why Federally graded beef is often referred to as "rolled beef." The grade designations are in full grades. The Cutter and Canner

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Fig. 21.11—Belly view of lamb showing some fat streaks in the flank and well-covered kidney.

grades are not rolled. If the buyer wishes to know whether the rolled beef of the grade he is buying is in the top, middle, or low bracket of the grade, he can demand a grading certificate which will so indicate.

Lamb

Lamb carcasses are not classified by sex but by age. Decidedly staggy buck lambs are generally segregated but are eligible to the same grades. Ovine carcasses are classified as lamb, yearling mutton, and mutton on the basis of characteristics of the bones, general conformation, and characteristics of the flesh.

Lamb carcasses always have a break joint on their front shanks and generally have narrow rib bones, a rather regular contour, and a pink to light red color of lean. They have a considerable amount of red in the ribs and a somewhat smaller amount of shank.

Yearling mutton carcasses may have either break joints or spool joints on their front shanks, have moderately wide ribs, slightly irregular contour (they are slightly pot bellied), and a darker color red to the lean. They have only traces of red in the ribs and on the break joint.

Mutton carcasses always have the mutton or spool joint on the front shank, have wide ribs devoid of any red color, are rather irregular in shape, and have a dark red color to the lean.

Procedure

It is always well to look for the presence of the lamb joint. Some enterprising committee might stick in a highly finished mutton carcass that looks Prime, to check on whether the contestant is aware of the age factor. (Such an incident is not allowed in intercollegiate contests but that does not say that such a situation is ideal from the educational standpoint.)

Because sheep carcasses are not as closely nested on the rail as the beef carcasses, and because they are unsplit, the grader uses a slightly different approach than the one explained in beef grading.

Finish and Conformation

In beef grading, determination of sex, stage of maturity, quality, conformation, and finish were studied in the order named and for the reasons given under beef carcass grading. This may

of the lamb and its final cut out value. A view of the back is best for a study of conformation such as fullness and plumpness of the leg, shortness of shank, width and thickness of the back (loin and rib), neatness and fullness of the shoulder, length of neck, general contour, such as uniformity of width, balance of weight between fore and hind saddle, length of carcass, and brightness or attractiveness of the carcass.

Turn the lamb for a belly view to check on the stage of maturity and quality. Young lambs have narrow rib bones showing a red streak along with red, moist, porous break joints. Grasp the flank to test for fullness and firmness, turn the flank outward to examine the flank muscle area for the presence of fat streaks, and observe the color. It should be bright pink. Examine the rib area for signs of feathering between the ribs or any overflow fat over the inside of the rib adjacent to the backbone (channel fat). The degree to which these are present determines its quality. Read the Federal grade specifications carefully.

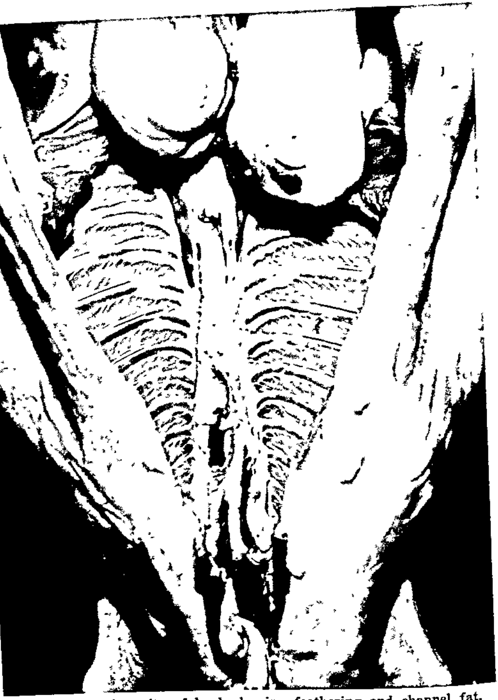


Fig. 21.12—Rib cavity of lamb showing feathering and channel fat.

not be the accepted routine practiced by all graders but it is a logical approach.

In the case of lamb carcass grading, it is natural for one to first examine the back of the carcass. The extent and quality of external fat covering has considerable bearing on the quality

put the numerical position of the way the carcasses rate in size, color, marbling, and firmness of the rib eye. Step back while the hounds bay and study the card which may look something like this:

1	3	2	4	conformation
3	1	4	2	external finish
1	3	2	4	size of rib eye
3	1	4	2	color
1	3	4	2	marbling
1	3	4	2 (W)	firmness
1	3	4	2	final

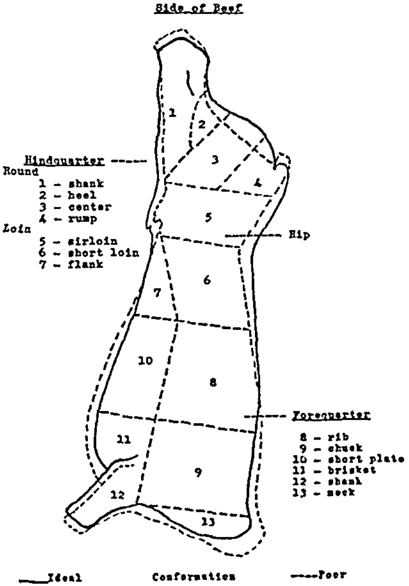


Fig. 22.1—

XXII.

MEAT JUDGING

Judging beef carcasses differs from beef grading in several respects; the carcasses must be rated or placed in the order in which the one excels the other on the basis of conformation, finish, and quality. Since the four specimens may fall in the same grade, or with an assured spread of not more than two full grades,[1] a more critical examination and evaluation of such factors as meatiness and trimness as they affect yield may have to be emphasized. Remember that stage of maturity and quality come first. It takes a lot of conformation to compensate for a lack of marbling in the three top grades of beef, just as it takes a lot of marbling to compensate for maximum maturity. It is assumed that the previous chapters have been digested and assimilated, therefore no further explanation of conformation, finish, and quality, as they apply to carcass judging or judging of wholesale cuts, will be made.

JUDGING ROUTINE

The first impression is more often right than wrong, so take a good look at the carcasses from a distance in the three minutes allotted. Don't stand there flexing your leg muscles for a jump toward the carcasses at the sound of the whistle to see how discourteous you can be to the opposition. The reason why the first general impression is likely to be correct lies in the fact that it takes into consideration the outstanding points of excellence or inferiority as far as conformation and external finish are concerned.

Make note of this snap placing on these two factors. When the horn blows and the hunt is on, take a look at the rib eye muscle of each carcass, and on the card below the snap placing

[1]Contest regulations.

muscle, with the exception of coarseness of bone. This saves time that can be used for note taking in the reason classes.

REASONS

Since the above placing is not mythical, let's take a look at the reasons as they might have been written:

First No. 1/3

As I see this class, there is a close top pair and a teaser. The over-all thickness of the No. 1 carcass with its deep full round is outstanding. This meatiness is reflected in the large size of the rib eye. The marbling in the rib eye of the No. 1 carcass is slightly more abundant and finer in its webbing. There are two faults that I find in the No. 1 carcass—a slightly darker color of lean and the unevenness of the external fat covering in the region of the rump and loin edge. I'll stay with the No. 1 carcass on its general meatiness and higher degree of marbling, since both No. 1 and No. 3 carcasses appear equally firm, possessing hard fat.

Second No. 3/4

The No. 3 carcass excels the No. 4 carcass in yield. Quality-wise, I would rate them equal, but No. 3 carcass has balance and trimness, a very even external fat covering of firm, bright fat. Its large rib eye with considerable less bark showing, its smooth shoulder, and its more equal balance in weight between hind and fore quarter, are outstanding points of superiority over the No. 4 carcass.

Third No. 4/2

To me this carcass is in a class of its own, the tallow class. Because it has quality in abundance, it must go over the lower quality but more meaty No. 2 carcass. The No. 4 carcass is a real pain in the neck to sell at retail without going bankrupt. Low prime marbling, excellent color, firm as an oak floor, and that's it. The eye is very small, the round is tapering with a decided dish on the outside augmented by the excessive fat deposit on the rump. Since the size of the rib eye is generally larger than the sirloin strip, I can visualize a porterhouse steak that is 50% fat and 50% lean.

The (W) in this case means watery or soft. Remember, don't touch. Use the eyes—watery eye (not supposed to be a joke). Give the class a final inspection to check the placing and note whether stage of maturity is sufficient to cause a switch to be made. If so, it is because the committee made a slip; the carcasses are supposed to be of practically the same age.

It will be evident from what has been said that looking for the indications of quality on the inside of the carcass was unnecessary. All the factors of quality are evident in the rib eye

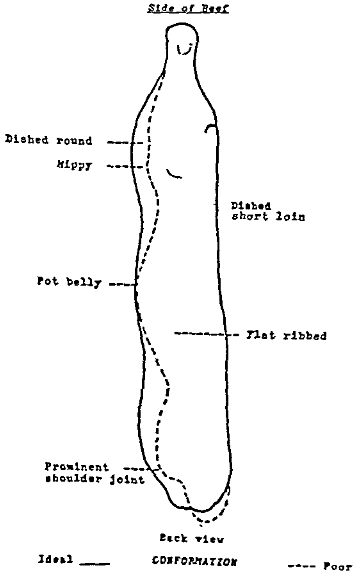


Fig. 22.2—

Beef Chuck

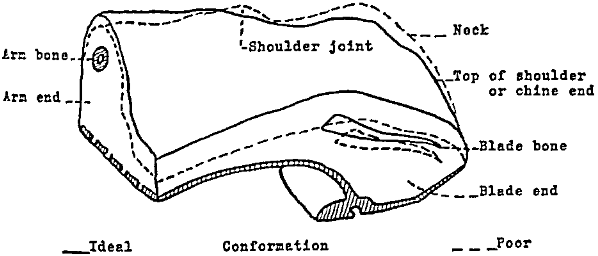


Fig. 22.3—

into the English cut (arm end of the 4th and 5th chuck rib). The blade end should be thick and give the appearance of plumpness as against flatness. A very good indication of meatiness and plumpness is the prominence of the shoulder joint. If this joint is hidden, the muscling is heavy; if prominent, the chuck will be flat and lack muscling.

The neck should be short and blend in with the rest of the chuck. Long, flat necks or long, thick necks are objectionable.

Quality

The first thing to do is to inspect the bladebone to see that it is still white and cartilaginous at the fifth rib. Then look at the chine bones to see if the ends (buttons) are still soft and white and the bone itself red and porous. It is always a good procedure in judging any wholesale cut to first determine the age of the animal because a hard bone, regardless of the excellence of conformation or the superiority of the marbling, will degrade a cut into the commercial grade. (Under present intercollegiate rules, handling is not permitted but it will not be necessary to do so because cuts from only young animals are used.)

The color of the lean should be bright, cherry red. Degrade the darker colors of red. Marbling should be abundant on the blade end. The same degree of marbling will not be in evidence on the arm end since the muscles are attached to the much exercised shank muscles. The surface of the meat should present a smooth, velvety appearance and be firm and not watery.

rth No. 2

Because of a decided lack of finish with only a modest amount narbling showing in a rib eye that runs a little shady and htly soft, I place it down, assured that it will beat the pants No. 4 carcass in yield, but of a lower grade of meat.

UTION

y reasons given in this chapter reflect an individual. As long the contestant sticks to the facts and presents them clearly the judge can follow the reasoning without glancing back to how they were placed, he can be considered to be in good m. The amount of knowledge possessed by the contestant will ow up in his use of meat terms and the applications of facts economics. No two people express themselves alike.

Only twelve minutes are allotted to writing reasons, so don't iste time but write legibly. An intermission of three minutes ill be given between writing reasons on each class to allow the ntestant to review his notes on the next class.

UDGING WHOLESALE (PRIMAL) BEEF CUTS

his is a closer approach to the retail cuts that a consumer must elect.

eef Chucks (Regular)

This primal cut is utilized primarily for pot roasts, swiss nd braised steak, boiling beef, stew beef, dried beef, and ground neat. The blade and arm ends of the chuck present a considerble cut area for judging quality.

Finish

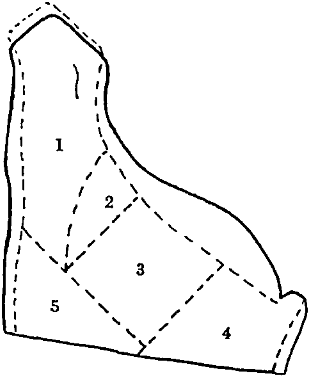
High quality beef chucks are completely covered with a firm, lry fat that is laid on smoothly. Discount soft, oily fats. A tenlency toward a heavy fat deposit over the clod muscle in the enter of the shoulder is evident in highly finished chucks. Large fat deposits between muscles (intermuscular fat) must be discounted.

Conformation

Uniformity of thickness is important. The arm end should be rounded and heavily muscled, and not fall away too rapidly

ne, flat ribs, a yellow cast to the fat, and a gummy feel to the
n spells "cow ribs."

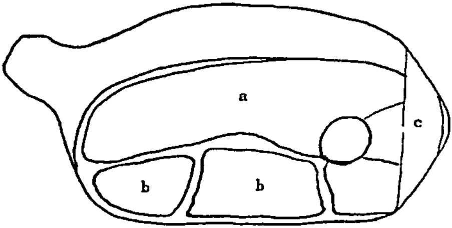
Beef Round



1. Shank
2. Heel
3. Top and bottom round (center cut)
4. Rump
5. Round tip (sirloin tip)

_____ Ideal Conformation Poor. . . . .

Beef Round (Rump Off)



a. Top (inside round)
b. Bottom (outside round)
c. Round tip

Fig. 22.5—

JUDGING BEEF RIBS

Beef ribs constitute the highest priced cut in the fore quarter. It is suitable for dry-heat roasting and the steaks cut from the top grades are becoming increasingly popular.

Finish and Conformation

The external finish should be firm and dry and evenly distributed over the entire cut. Excessive external fat covering is discounted.

The rib eye muscle should be proportionally large in relation to the size of the cut and be oval in shape on the small end. A kidney shaped eye muscle is undesirable. A large rib eye muscle will make a meaty appearing rib. The blade end of the rib should be well fleshed, not flat nor too heavy. The contour of the external part of the rib down to the short rib section should be gradual and not dipped or dished. A combination of these desirable features of conformation result in a thick, well balanced cut that will yield a high proportion of the desirable rib eye (longissimus dorsi).

Quality

Inspect the bone to determine age, particularly the presence or absence of the buttons on the ends of the feather bones. Hard

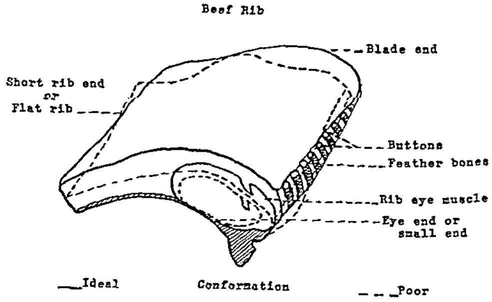
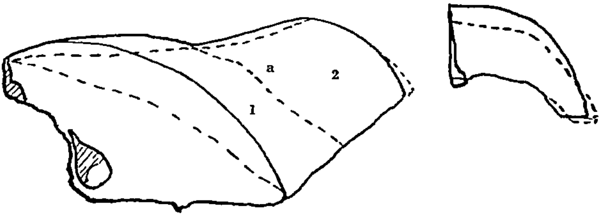


Fig. 22.4—

Beef Loin



1. Loin end (sirloin) 2. Short loin a. Hip

_____Ideal Conformation Poor. . . . .

Fig. 22.6—

Conformation

The thicker and heavier the muscling on a loin, the greater the value of the steak received by the consumer because of the lower net cost of edible meat. Look for full, rounded, meaty loin ends blending well into the short loin. An excessive dip or depression in front of the hip is a bad fault. The short loin should show fullness with a large, oval eye muscle on the rib end. Degrade flat loin ends, prominent hips, depressed and shallow shortloins.

Quality

Marbling is highly desirable in any cut of meat but it is doubly so in the loin cuts. When the choice is to be made between a fine web-like marbling or a coarse type of marbling, if the total amount appears to be the same, give preference to the former. Texture is also very important as it affects the tenderness of the steak. Color is probably more important in steak than in any other cut since the consumer sees such a large area of exposed meat, and is more apt to register a gripe if he does not like the color since it is a high-priced item.

The meat should be firm. Firmness increases as marbling increases, and moisture decreases as marbling increases. The reason, as stated elsewhere in this book but which can stand repetition, is that the moisture content of fat is 9% and of lean 60%-70%. Another reason for desiring firmness in any wholesale cut, and particularly those that are cut into steak, is that it is

Look for plenty of marbling, and a firm, bright red coloı meat of fine texture. Excessive intermuscular fat, particulaı at the junction of the rib eye with the short rib section, objectionable.

JUDGING BEEF ROUNDS

Beef round, consisting of the rump and butcher's round, is t source of the most popular steaks (round steak); popular becaı they contain so little bone and fat.

The external fat covering is generally rather sparsely d tributed over the round but tends to be heavy or patchy over t rump in the more highly finished beef. Select for smoothness a less waste in this area.

The conformation is very important since it determines t poundage of round steak that can be cut from the area betwe the rump and the stifle joint. An ideal round is plump and thi with good depth, and carries the muscling down well toward hock (full at the heel). Flat, tapering, and dished rounds heavily discounted.

Quality

The texture or grain of the muscles is easily determined a will be found to vary between top and bottom round. Use the round in making this decision. Firmness and marbling and g color are top requisites for prime rounds.

JUDGING BEEF LOINS

Conformation and quality are very important in this wholes cut because from it are secured the most tender and most pensive steaks in the entire beef carcass. It represents 17% the carcass weight.

Finish

Highly finished cattle have heavy external fat deposits this area, and particularly over the region of the short l Select for smoothness and minimum amount of patchiness. the trimmed loin (flank off, kidney and suet out) the remain of the kidney fat should be hard and brittle. The external should have similar qualities. A lack of external and inteı kidney fat is associated with the lower grades.

tractive No. 3 rib. I'll be a fat head in believing that the average customer would take a cut from the No. 4 rib in preference to No. 3 because it is bright and attractive in color of fat and lean, even though it has only a slight amount of marbling. I even prefer the conformation of No. 4 in that it is not as heavy on the blade end. However, I'll stay with marbling and the No. 3 rib.

Fourth No. 4

What more can I say?

CAUTION

The above reasons will hit a man in the meat business, but with the long-haired professors who may be the ones to read them, beware. There is considerable argument pro and con as to whether it is necessary to state reasons why a specimen is placed last, and while the verbal battle rages, continue to give a statement of the main weakness of the last place specimen.

PORK CARCASS JUDGING

Ideas and standards change from time to time, and pork standards are undergoing this change. The causes are (1) consumer preference for lean pork, and (2) the depressed lard market due to competitive vegetable shortening. The student judge must be governed by prevailing standards in his placing of carcasses and probably change his conception of quality in pork as compared to quality in beef.

Finish

The reason that the author considers finish before conformation in judging all classes of carcasses, with the exception of grading beef carcasses, is that the most obvious thing to the eye should come first. In pork, it definitely is the first thing considered because it is the basis of grading. Therefore determine, from the back fat thickness, the grade into which the carcass falls. To do this one must be familiar with the back fat thickness that is associated with a certain length and width of carcass designated for the particular grade.

If, for example, the four specimens to be judged consisted of a U. S. No. 1, U. S. No. 2, U. S. No. 3, and a Medium carcass, the placing would be on the basis of grade in the order named and wholly a matter of grading. Since classes for judging are

easier to cut a firm steak of even thickness without having it flop over the knife or ooze away from the knife edge.

Do not fail to inspect the chine bone to determine if it can qualify for the top grades for age, or whether a white, hard, fused bone in the sacral region will degrade it into the Commercial grade.

REASONS

The reasons on primal beef cuts will reflect the contestant's knowledge and training on grade and yield as might befit a meats salesman. Using an actual class of ribs, the contestant's statistics might appear as follows:

1	2	4	3	conformation
2	1	3	4	bark (external finish)
2	1	3	4	size of rib eye
1	2	3	4	marbling
1	2	4	3	color
1	2	3	4	firmness and texture
1	2	3	4	final placing

Reasons might read as follows:

First No. 1/2

In this pair, I had to decide whether I wanted slightly more quality and a little less meat, so I settled for quality. Both ribs appear firm and have equally good color and texture. However, the slightly abundant marbling in the No. 1 as against a moderate amount in the No. 2 rib makes it the top quality rib in the class. I don't like the heavier layer of outside fat nor the smaller rib eye of the No. 1 rib but since the conformation of the two ribs was in balance for size and uniformity, I picked No. 1.

Second No. 2/3

Here is a rib that will sell. It has a meaty appearance on both the blade and small end of the rib, more so than the No. 3 rib. The marbling is practically the same in both No. 2 and No. 3 rib, but No. 3 lacks the bright color of lean and bright fat evident in No. 1. In other words, No. 3 lacks customer appeal.

Third No. 3/4

I'm a fat head on this pair but I'll have to stick to the greater degree of marbling evident in the not so bright or at-

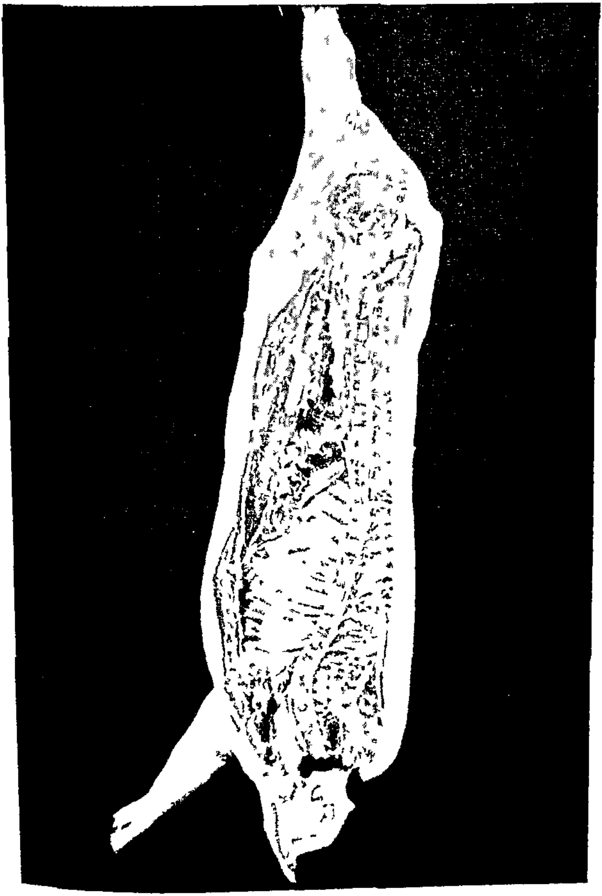


Fig 22.7—U. S. No. 1 grade pork carcass

not made upon that basis, it becomes a matter of judgment as to the merits of one carcass over another carcass of the same or a near grade. (1) Look for an even distribution of back fat. Many hogs have a tendency to lay the fat on more heavily over the shoulder and the ham end of the loin. (2) Look for a firm, white fat that is not greasy to the touch. Soft pork must be discounted rather severely. (3) Look for the indications of marbling on the inside of the carcass. These are the fat covering over the rib, feathering between the ribs, and the evidence of marbling in the flank and the exposed face of the ham.

The final decision between two specimens may hinge on the general distribution of the external finish. A bulging or prominent shoulder on a fat hog does not necessarily indicate more muscling, but more often a heavy fat deposit in that area. A bulging ham, carried well down toward the hock—making it look meaty—is ofttimes a muscle mirage caused by heavy fat deposits. Try to detect these camouflages of conformation because they result in a higher fat yield.

Conformation

Note the form or shape of the carcass in respect to its length, depth, smoothness of side (freedom from wrinkles), plumpness of ham, shortness of shank, neatness of shoulder, thickness of the belly—particularly in the region of the ham pocket—, and trimness of the jowl. All of these characteristics give balance and uniformity to a carcass and are reflected in the yield of lean and fat cuts.

The length of the carcass is not too important provided it is in balance and conforms to standard measurements for the grade. Keep in mind, however, that the quality of the short carcass must be equal to that of the longer carcass and must have marketable cuts. It so happens that most of the carcasses that conform to the top grade specifications are between 29 and 31 inches long (from the 1st rib to the forward end of the aitchbone), and weigh between 140 and 185 pounds.

Discount heavy jowls, heavy shoulders, wrinkled sides, coarse skin, sloppy bellies (excessive mammary development), long ham hocks, tapering or banjo hams, flat hams, and carcasses that are too flat (those which lack loin development and spring of rib).

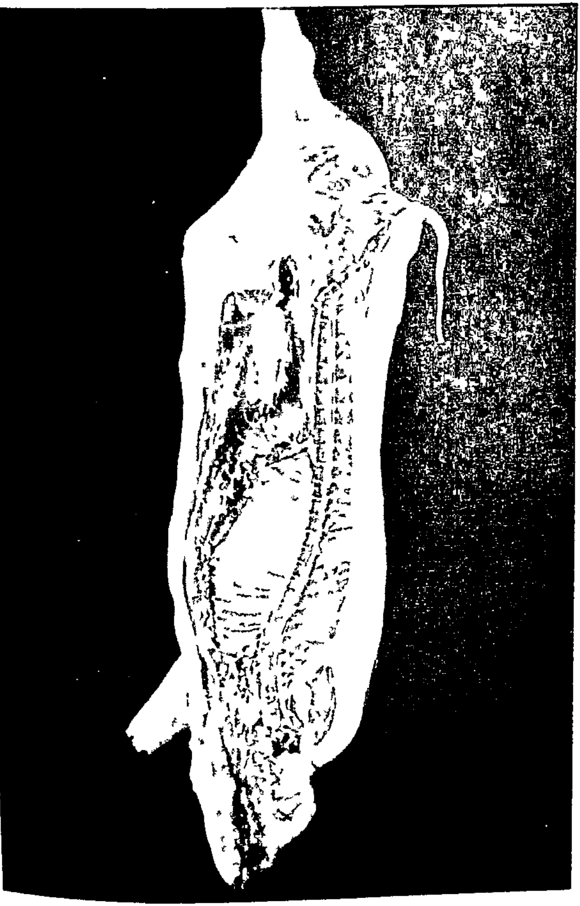


Fig. 22.9—U. S. No. 3 grade pork carcass

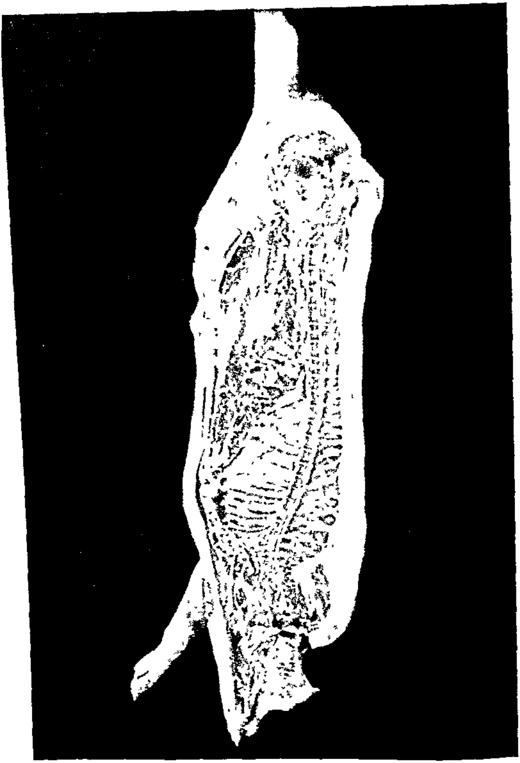
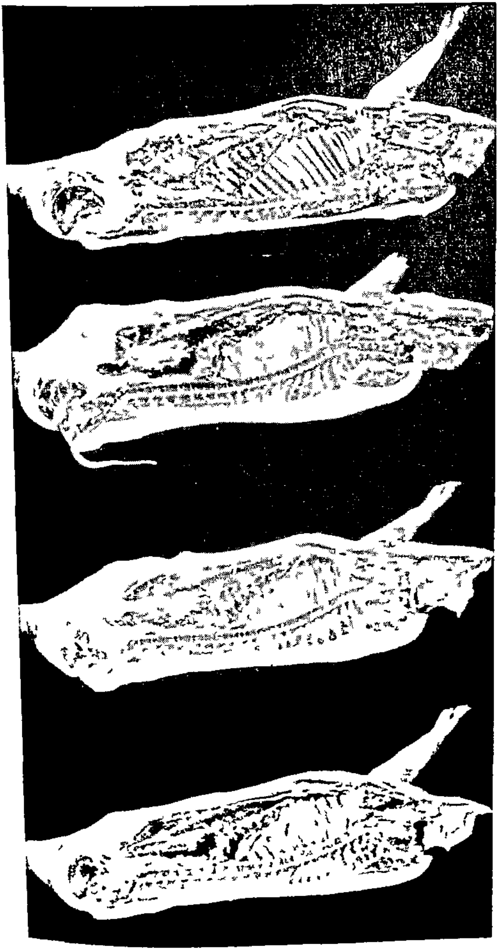


Fig. 22.8—U. S. No. 2 grade pork carcass.



A
U S No 1

B
U S No 2

C
U S No 3

D
Medium

Fig 22 11—Grades of Pork Carcasses

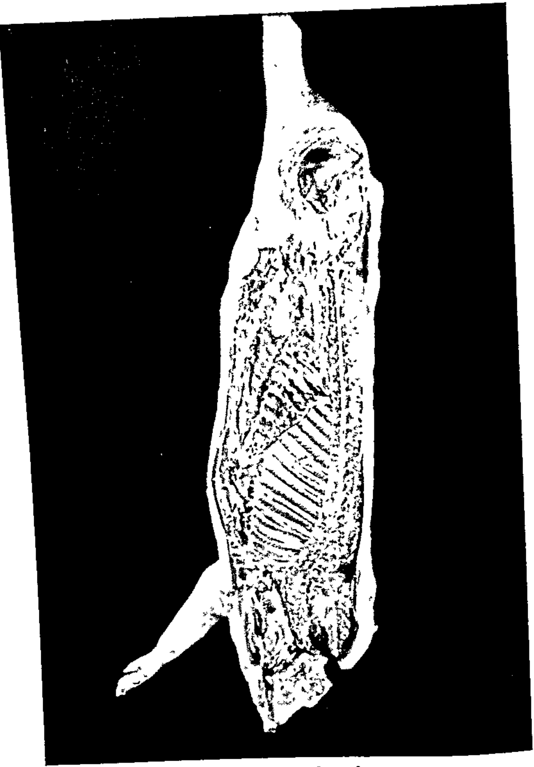
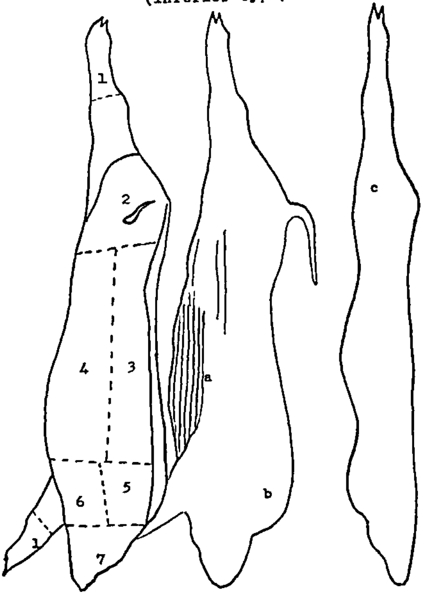


Fig. 22.10—Medium grade pork carcass.

emphasize color since 75% to 80% of the carcass has its color changed in the curing process. Dark muscle is, however, associated with such things as maturity, underfinish, and softness, all of which are undesirable.

At present, pork is practically devoid of marbling due to the young age at which hogs are marketed. Minus this quality fac-

Pork Carcass
(Inferior Type)



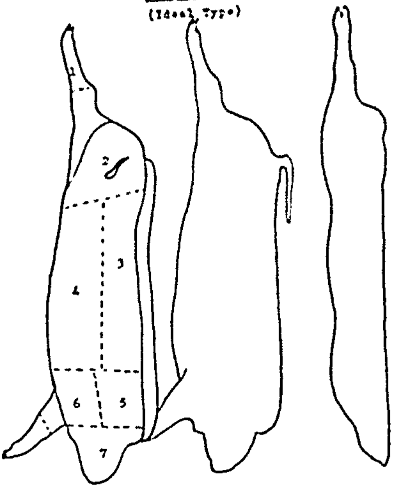
1. Feet
2. Ham
3. Loin
4. Belly
5. Boston butt
6. Picnic
7. Jowl

a. Wrinkled side
b. Heavy shoulder
c. Long, tapering ham

Note the coarse bone in the feet, the long shanks, wrinkled side, weak loin, and uneven thickness of fatback.

Fig. 22.13—

Pork Carcass
(Ideal Type)



1. Feet
2. Ham
3. Loin
4. Belly
5. Boston butt
6. Picnic
7. Jowl

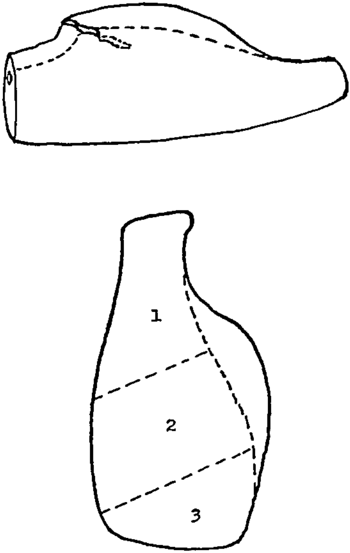
Note the uniform thickness of fatback and the smooth side. Compare the fineness of bone in feet with that of the inferior carcass.

Fig. 22.12—

Quality

A carcass of quality is one that is bright in appearance. This brightness is caused by (1) the chalk white, firm fat; (2) the bright pink color of the flesh on the inside of the belly, and (3) the feathering and frosting (overflow fat) on the inside of the rib area. Quality also is indicated in the smoothness of the skin and the firmness of the bones in the feet. We probably over-

Ham



1. Hock   2. Center cut   3. Butt

____Ideal   Conformation   Poor.....

Fig. 22.14—

lard. In the case of the fresh, trimmed cuts, the quality of the fat is more generally reflected in the firmness of the lean. A lean that is marbled with firm fat will be firm. The converse is true. Therefore, discount soft, oily, and off-color fat. Discount prominent amounts of intermuscular fat showing on the butt end.

The texture of the lean is very similar for hogs in the same age bracket. The grain and color of the lean change with the increased age of the animal. A desirable color for pork is considered to be bright pink but is more often a grayish pink tinged

tor, pork carcasses must be bright, firm, thick, and meaty, and carry a back fat thickness that conforms to the standard set for the particular grade. They should show considerable feathering in the rib area to indicate marbling, even though it does not guarantee it.

Excessive back fat thickness is no guarantee that the lean is marbled. Actually, the only sure method of determining marbling in a pork carcass is to see a cross section of the rib eye muscle. Since the size (area) of this muscle is very important, pork carcasses should be ribbed down for judging purposes. They are being ribbed for certified litter rating in developing breeding stock for meat type hogs.

JUDGING HAMS

Since hams are trimmed into skinned hams, thus removing the major part of the fat from about two-thirds the surface area of the ham, any mention of finish would be in reference to the amount of fat on the heel of the ham. Discount for a heavy layer of heel fat.

Conformation

Basically, a ham may be considered in three parts: butt, center cut, and shank. Individually they represent one-third of the weight of the ham. Price-wise, the center cut is the profit item, the butt is a 10%-15% over cost item, and the hock is a loss item.

This price picture sets up the pattern of what a ham should have as far as conformation is concerned. A short, slim hock, with a moderate fat bulge at the heel, means less weight in this loss item. A long (from aitchbone to 1 inch above stifle joint) center cut that is thick (the distance through the ham from inside to outside) and has a good proportionate depth will make for more profit. A ham butt that is full fleshed rather than pointed will throw more weight into this cut and more nearly cover the loss in the shank. The over-all appearance of a ham of the desired conformation features meatiness, plumpness, thickness, and general trimness, with as much weight as possible represented in the expensive center cut.

Quality

The quality of the fat is a very important factor to consider in the judging of pork carcasses because it covers the item of

ture should be fine, the color grayish pink tinged with red, the lean might show marbling, and the fat should be firm and white.

Coarse texture and dark flesh are found in the heavy bellies from older hogs such as packing sows.

REASONS

Until the time when pork carcasses will be ribbed in contest judging, marbling must be based on feathering and fat covering over the ribs. Let's take a look at the statistics that might appear in a contestant's notes in placing a class of pork carcasses:

4	1	3	2	External finish (back fat)
4	1	2	3	Smoothness (freedom from wrinkles)
1	4	3	2	Plumpness of ham
				Shortness of hock
4	1	3	2	Depth of carcass
4	1	3	2	Feathering
4	1	3	2	Color
4	1	3	2	General conformation
4	1	3	2	Final placing

The reasons might read as follows:

First No. 4/1

I would say that the No. 4 carcass is easily the top quality carcass of the class. All four carcasses, in my judgment, can be rated as U. S. No. 1. My main criticism of the No. 4 carcass is its lack of thickness through the ham. I prefer the thicker ham of the No. 1 carcass. Other than that, the smaller bones in the feet, the smoother skin, and the over-all fat covering of the chest cavity indicate quality not possessed by No. 1 in the same degree. Both carcasses are equal in thickness of belly and in the firmness of the fat, in color of flesh, and in freedom from wrinkles. The No. 1 carcass might be somewhat criticized for having a slightly more uneven back fat thickness.

Second No. 1/3

I consider the No. 1 carcass an easy second because it more nearly meets the standards of a meat type hog with sufficient quality to make good meat. It is a thicker carcass throughout, possessing more balance (plump ham, wide loin, neat shoulder,

with red, and in many cases a muscle next to the bone may be dark, giving what is termed a two-toned condition. Other things being equal, the brighter, more evenly colored meat is given preference. Unfinished pork is often referred to as being "vealy" in color, having a grayish red tinge to the meat.

JUDGING BACON

A uniform thickness is very important in a side of bacon. The most desirable thickness is 1½ inches. Bacons that are thick on the shoulder end, thin at the ham end, and dished in the ham pocket, or that are particularly thick on the loin side and taper decidedly at the brisket, are objectionable for slicing.

The proportion of lean to fat should be about 40-60. The consuming public desires fairly lean rather than fat bacon. The leaner the bacon, the less likely it is to be thick or firm, and therefor a very lean bacon is not a quality bacon.

Firmness is exceedingly important in bacon from the standpoint of slicing, keeping, and frying qualities. A soft bacon requires a lower slicing temperature, will become rancid more quickly, and has a greater shrinkage in frying. The skin should be smooth, thin, and free from root hairs and blemishes.

Color, texture, and marbling are not as important in bacon as in the other fresh pork cuts because it has a large surface area that is smoked, and because bacon is served in very thin slices. However, from the standpoint of judging fresh bacon, the tex-

Fig. 22.15—

fell over the back stand out quite prominently in well-finished carcasses This is referred to as the chevrons or the Christmas tree

Conformation

Thickness and meatiness in lamb carcasses are important because the economic value of cuts from small carcasses is de-

Fig 22 16—Grand Champion fat wether 1939 International Livestock Exposition, Chicago Ill Live wt., 100 lbs dressed wt 64 lbs yield 64 per cent This is historic and teaches a lesson in conformation as does Fig 22 17 The size of rib eye and the marbling have never been exceeded

firm and moderately thick bacon), and a brighter, firmer carcass than No. 3.

Third No. 3/2

This is my problem pair. Both carcasses appear to me to be on the unfinished side, yet possessed of too much meat to be graded medium. I base my preference for the No. 3 carcass on its more even back fat thickness, its slightly greater depth of carcass, and its slightly brighter color of lean. I doubt whether either carcass has sufficient thickness of belly, particularly in the ham pocket, to cut No. 1 bacon. Both carcasses show wrinkled sides, with No. 3 showing deeper wrinkles; both have long ham hocks and lack of firmness. Feathering is about the same.

Fourth No. 2

My reason for placing No. 2 in this spot is primarily for its lack of brightness, its slightly vealy color to the flesh, and lack of depth.

CAUTION

It is no crime to find equal qualities in both carcasses or some of each in all four carcasses and admit it. The crime lies in improvising, or making a false statement, or referring to the wrong carcass. Tell the truth, as you see it, in a simple manner that can be easily followed by the committee who must grade the reasons.

JUDGING LAMBS

The amount of finish necessary to make a choice quality lamb is not as great as is necessary to make the same quality of beef. Consumers generally are not very tolerant of fats, and particularly lamb and mutton fat. The great difficulty with highly finished lamb or mutton carcasses is that the deposition of intermuscular masses of fat outstrips intercellular marbling. This is particularly true of the shoulder.

Finish

Sufficient white, brittle fat to cover the back with ¼ to ⅜ inch of fat with a lighter covering over the leg and shoulder is adequate finish for a quality lamb carcass. A papery (no fat under the fell) back on a carcass shows lack of finish. A fiery color to the fat is objectionable. Thin strips of lean under the

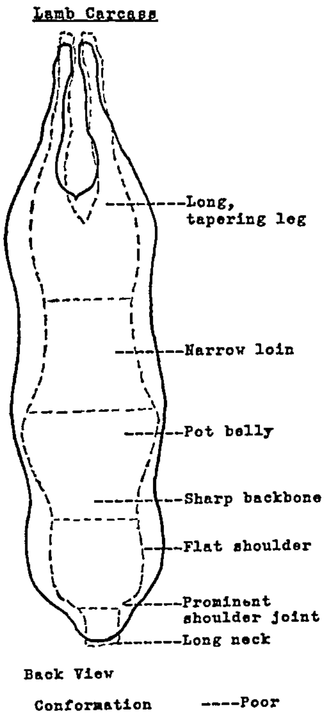


Fig. 22.18—

Pot-bellied carcasses are objectionable because they increase the amount of cheap flank and breast meat. The necks should be short and thick, rather than long and thin. The break joint must show four well-defined red ridges.

Quality

The amount and character of the internal and external fat on a lamb are the visible conditions for determining quality unless the carcass is ribbed down. The fat should be firm, white,

pendent in a large measure on the percentage of lean to bone. In *Good to Choice carcasses the separable fat should not run over* 30% (25% to 30%) and the lean should amount to 50% or 55% of the carcass as against 20% bone.

The carcass should be fairly short and compact, thick, and uniformly wide. Carcasses that are slightly rangy are not objectionable provided they are uniformly wide and thick and not platy. Neat, smooth shoulders, well fleshed over the blades and covered with a thin layer of white fat, are preferred to narrow or heavy shoulders.

The legs should be short and plump and full in the crotch. Long, tapering legs are not characteristic of a good lamb carcass type. Only a light fat covering over the outside of the leg can be expected in even the most highly finished carcasses. A slight crease over the backbone is indicative of a well-fleshed back but a prominent backbone indicates a shallow muscling and a small rib eye. Flat lamb chucks with prominent blades at the top of the shoulder are not characteristic of good conformation. The loin and rib rack should be broad, thick, full, and well turned in the rib to give the carcass a neat, trim appearance.

Fig. 22.17—The fore and hind saddle of the Grand Champion fat wether shown in the preceding illustration. Note the uniform fat covering and the high degree of marbling. The lamb was dressed in the Meats Laboratory of The Pennsylvania State University.

Lamb Carcass

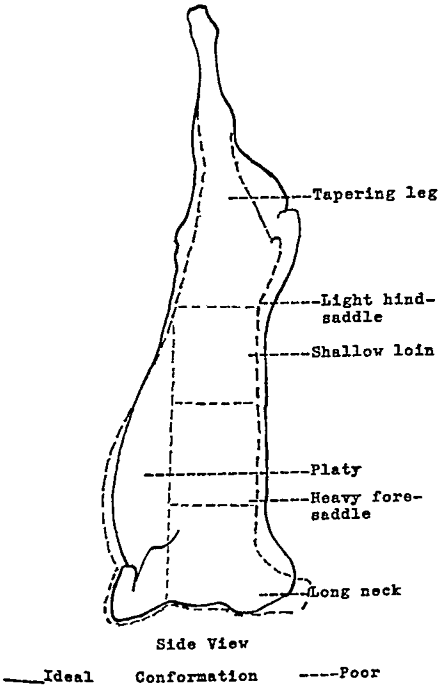


Fig. 22.19—

Second No. 3/2

The main difference between No. 3 and No. 2 is again one of conformation. Where No. 3 is slightly pot bellied, No. 2 is lacking in plumpness and meatiness of the leg. The external finish of No. 2 carcass appears to be slightly heavier, as is the kidney, but quality wise, I see no difference. Since more of the value lies in the leg and with less fat waste, I go with the No. 3 carcass.

and waxy and be evenly distributed over the entire carcass. A papery condition over the backbone area is indicative of insufficient finish and lack of firmness. The fat covering on the legs is a good gauge of the amount of finish because this region of the carcass is the last to be covered in the fattening process.

Feathering between the ribs in the chest cavity, the amount of channel fat along the spine, and fat streaks in the flank are good indices of marbling. Firmness is associated with finish, and thin carcasses are naturally soft because the hard fat is absent. If, however, the fat is oily and soft, the carcass is lacking in firmness, even if it is well finished. The flank should be firm and dry, and the inside of the flank should show a few fat streaks (if the lamb is Prime) and have a bright pink color to the flesh.

REASONS

It is the opinion of the author that lambs other than those to be graded should be ribbed down. This practice has been followed for years in the commercial carcass contests and is the only way to do the job right. It would make for more accurate student appraisal of quality in lamb carcasses, which is pretty much guesswork as it now stands. Contest lambs for FFA and 4-H should be ribbed.

A contestant's notes in a class of light lamb carcasses might read as follows:

4	3	2	1	Conformation
4	3	2	1	External finish
4	3	2	1	Firmness
4	3	2	1	Feathering
4	3	2	1	Color
4	3	2	1	Final placing

The reasons might read as follows:

First No. 4/3

To me this class of lambs is a tight trio with an obvious bottom. The comparisons seem so slight that I may be repetitious in my reasons. The No. 4 carcass is more uniform in its conformation. I would call it a picture carcass. This uniformity is due to its trim middle and even width throughout. Frankly, I see no difference in quality between No. 4 and No. 3. I fault No. 3 for being slightly pot bellied and a little deeper through the fore saddle, yielding more of the cheap breast meat.

less likely to miss these key points, but it weakens the effectiveness of a set of reasons because it sidesteps argument.

The most convincing and effective reasons are those presented through *comparisons,* where a contestant presents the superior qualities of one carcass or cut over another.

TERMINOLOGY

The ability to give convincing reasons is also dependent upon the contestant's familiarity with the names of the various cuts, their location, and the terms used to describe locations. The following are the more common expressions used for descriptive purposes as they refer to desirable (pro) and undesirable (con) qualities. Any statement must be tempered by the degree of variation that exists.

Conformation

Depth of Carcass—the distance from the tip of the chine bones to the underline.

Pro—Deep, good depth, more depth, deeper.
Con—Shallow, lacks depth, or too deep, platy.

Length of Carcass—the distance from the hock to the neck.

Pro—Short, compact.
Con—Rangy, stretchy, long.

Width of Carcass—the distance from the chine bones to the outside line or curve of the carcass.

Pro—Wide, uniform width, thick.
Con—Narrow, lacks width, not uniform in width.

Finish

Pro—Smooth fat covering of proportionately uniform depth covering entire carcass. Abundant amount of pelvic and kidney fat, but not excessive. Liberal protrusion of fat between the chine bones, and abundant and even distribution of overflow fat over the inside of the ribs. Extensive feathering, intermingling of fat with the lean between the ribs. The fat is dense and firm.

Con—Rough, patchy, and uneven fat covering or lack of external finish (state where). Excessive or very little pelvic or kidney fat, no protrusion of fat between the chine bones, absence of overflow fat, very little feathering. The fat is soft and oily.

Third No. 2/1

First let me say that the uniformity of width of the No. 1 carcass is superior to No. 2, but No. 1 is a narrower, longer carcass that lacks the finish and quality of the No. 2 carcass. The difference in uniformity of width is caused by the pinched leg of the No. 2 carcass. The No. 2 carcass shows an over-all external fat covering, a firm pink flank, a well-feathered rib section, and a quality not possessed by the No. 1 carcass, probably by one full grade.

Fourth No. 1

The No. 1 lamb goes in this spot because of a lack of quality and a lack of width commensurate with its length.

REASONS

The ability to tell by oral or written word the reasons why one carcass or cut is superior to another depends upon (1) the contestant's training and experience, (2) his knowledge of meat terminology, and (3) his method of presenting the reasons.

Written reasons are unlike oral reasons in that the person who writes them has certain information before him that does not require repetition. The card upon which reasons are written is divided into four equal parts, headed respectively by First, Second, Third, and Fourth. If No. 2 carcass or cut is placed first by the contestant, it is suggested that the carcass placed under it be indicated as 2/1, meaning No. 2 over No. 1. This makes it easier for the person who is reading and grading his reasons.

Presentation

A common fault of contestants is that of giving what is termed *stereotyped* reasons. This is generally true of those who have not had sufficient training, and who have acquired a vocabulary of meat terms that are more or less meaningless to them. As a result, they know how to say or describe certain things, and these are repeated verbatim for each carcass or cut.

Some are taught a *descriptive* method that simply describes the merits or faults without direct comparison. This method may be rather effective where judges are insistent that a contestant see certain points that they had in mind when they made the official placing. By following such a method, a contestant is

less likely to miss these key points, but it weakens the effectiveness of a set of reasons because it sidesteps argument.

The most convincing and effective reasons are those presented through *comparisons,* where a contestant presents the superior qualities of one carcass or cut over another.

TERMINOLOGY

The ability to give convincing reasons is also dependent upon the contestant's familiarity with the names of the various cuts, their location, and the terms used to describe locations. The following are the more common expressions used for descriptive purposes as they refer to desirable (pro) and undesirable (con) qualities. Any statement must be tempered by the degree of variation that exists.

Conformation

Depth of Carcass—the distance from the tip of the chine bones to the underline.

Pro—Deep, good depth, more depth, deeper.
Con—Shallow, lacks depth, or too deep, platy.

Length of Carcass—the distance from the hock to the neck.

Pro—Short, compact.
Con—Rangy, stretchy, long.

Width of Carcass—the distance from the chine bones to the outside line or curve of the carcass.

Pro—Wide, uniform width, thick.
Con—Narrow, lacks width, not uniform in width.

Finish

Pro—Smooth fat covering of proportionately uniform depth covering entire carcass. Abundant amount of pelvic and kidney fat, but not excessive. Liberal protrusion of fat between the chine bones, and abundant and even distribution of overflow fat over the inside of the ribs. Extensive feathering, intermingling of fat with the lean between the ribs. The fat is dense and firm.

Con—Rough, patchy, and uneven fat covering or lack of external finish (state where). Excessive or very little pelvic or kidney fat, no protrusion of fat between the chine bones, absence of overflow fat, very little feathering. The fat is soft and oily.

Third No. 2/1

First let me say that the uniformity of width of the No. 1 carcass is superior to No. 2, but No. 1 is a narrower, longer carcass that lacks the finish and quality of the No. 2 carcass. The difference in uniformity of width is caused by the pinched leg of the No. 2 carcass. The No. 2 carcass shows an over-all external fat covering, a firm pink flank, a well-feathered rib section, and a quality not possessed by the No. 1 carcass, probably by one full grade.

Fourth No. 1

The No. 1 lamb goes in this spot because of a lack of quality and a lack of width commensurate with its length.

REASONS

The ability to tell by oral or written word the reasons why one carcass or cut is superior to another depends upon (1) the contestant's training and experience, (2) his knowledge of meat terminology, and (3) his method of presenting the reasons.

Written reasons are unlike oral reasons in that the person who writes them has certain information before him that does not require repetition. The card upon which reasons are written is divided into four equal parts, headed respectively by First, Second, Third, and Fourth. If No. 2 carcass or cut is placed first by the contestant, it is suggested that the carcass placed under it be indicated as 2/1, meaning No. 2 over No. 1. This makes it easier for the person who is reading and grading his reasons.

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Some are taught a *descriptive* method that simply describes the merits or faults without direct comparison. This method may be rather effective where judges are insistent that a contestant see certain points that they had in mind when they made the official placing. By following such a method, a contestant is

Blade end of beef rib—large end.

Loin end of beef rib—small end.

Blade end of chuck—the exposed blade cut from which the rib cut was removed.

Arm end of chuck—the end from which the shank was removed.

Chine end of chuck—top of the shoulder.

Blade end of pork loin—rib end.

Ham end of pork loin—hip end.

Butt end of ham—anterior to aitchbone.

Cushion of the ham—posterior to aitchbone.

Rib eye muscle—the large muscle over the rib—(longissimus dorsi).

Clod—the heavy muscling directly posterior to the blade bone (scapula) and fore arm (humerus).

Aitchbone—the large visible curved bone in a ham, leg of lamb, veal, and rump of beef (symphysis pubis).

Heel—just above the hock and posterior to the tibia.

Descriptive Terms

Abundant, angular, attractive, blocky, brittle, coarse, covered, cowy, dark, deep, dense, dished, dull, excessive, extensive, fiery, fine, firm, flabby, flaky, flat, fleshy, full, furrowed, gobby, greyish, grooved, gummy, hard, heavy, highly, hippy, irregular, light, marbled, meaty, narrow, neat, nicely, oily, open, overfinished, pale, papery, plump, poor, pot-bellied, prominent, proportioned, rangy, regular, ribby, rough, shady, shallow, sharp, shelly, short, skippy, slender, smooth, soft, solid, spongy, sticky, stocky, streaked, superior, tapering, thick, thin, tinged, trim, two-toned, unfinished, uniform, velvety, washy, wasty, watery, waxy, wide, and wrinkled.

Quality

Pro—State degree of marbling; desirable cherry red color of the lean; smooth velvety texture (fine grain); firm; red, porous chine and breastbone.

Con—State degree of marbling; dark in color; soft and watery; coarse texture or grain; white, flinty chine and breastbone.

General Terms

Balance—indicates a rather even or proportionate distribution of weight.

Banjo type—tapering.

Dished in the loin—shallow, grooved, furrowed.

Fiery—reddish tinge to the outside surface of the carcass.

Full at the heel—meaty at rear of hind shank.

Gobby—same as patchy.

Gummy—sticky, rubbery character to the lean.

Hippy—prominent hips, bony.

Meaty—a term used to designate a well-muscled cut or carcass.

Platy—excessive amount of the short plate and brisket, generally associated with large, unfinished carcasses; also heavy breast in lamb.

Plump—refers to the extra full contour of a carcass or wholesale cut caused by exceptional muscle development. Examples: plump round, plump ham, plump leg of lamb, etc.

Ribby—a pot-bellied carcass or one in which the eye muscle is small and the rib is long and flat.

Rough—uneven contour; also, uneven distribution of fat.

Shelly—a term that describes a chuck or fore quarter that lacks thickness.

Skippy—thin and soft (lamb and veal).

Spongy—soft.

Vealy in color—an expression used to describe the grayish-red color characteristic of young, unfinished beef.

Wasty—excessive amount of unevenly distributed fat; large kidney.

Location

Rib end of beef loin—small end.

Rump end of beef loin—large end, sirloin end.

Blade end of beef rib—large end.

Loin end of beef rib—small end.

Blade end of chuck—the exposed blade cut from which the rib cut was removed.

Arm end of chuck—the end from which the shank was removed.

Chine end of chuck—top of the shoulder.

Blade end of pork loin—rib end.

Ham end of pork loin—hip end.

Butt end of ham—anterior to aitchbone.

Cushion of the ham—posterior to aitchbone.

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CURED HAM EXHIBIT

Class I—Country Cured	Group I, 12-16 lbs.	Group II, 16-18 lbs.
Class II—Commercial Cured	Group I, 12-16 lbs.	Group II, 16-20 lbs.

	Days in Cure	Strength of Pickle	Days in Smoke
Class______Group______			
Entry No.____Wt. of Ham____	______	______	______
Method of Curing:			
Dry Sugar Cure	______	______	______
Sweet Pickle (long cure)	______	______	______
Sweet Pickle (stitched)	______	______	______
Sweet Pickle (artery cure)	______	______	______
Age of Ham______			

JUDGE'S SCORE CARD

Appearance	(Size, neatness of trim, conformation, freedom from salt crystals and salt streaks, molds, and foreign substances)—10 points	______
Quality	(Firm through center cut, no puffiness. Free from drip on butt or shank end, proportion of lean to fat, marbling)—15 points	______
Smoke Color	(Clean, light to dark amber or chestnut color. Dry surface, free from black, tarry residue)—10 points	______
Color of Lean	(Color should be pink and free from uncured, gray spots. Red or deep red with no gray spots receives no cuts in score if coloring is uniform and shows thorough cure)—10 points	______
Aroma	(Good aromatic odor. Off odors scored down.)—10 points	______
Flavor	(Medium salt, slightly tangy, but no sour taste.)—35 points	______
Texture	(Fine, firm grain)—10 points	______

Note: The above are samples of exhibitor's entry blank and the judge's score card that can be used in cured ham contests.

XXIII.

MEAT IDENTIFICATION

CARCASS BEEF

The outstanding characteristic of a beef carcass is its size. The more difficult task is to determine age and sex.

Age

The appearance of the split chine bones (backbone) of a carcass will indicate approximate age.

Yearling Carcasses

The carcasses of animals up to 36 months of age will show the presence of pearls or buttons which are the cartilaginous tips at the end of the superior process of the dorsal vertebrae. These superior processes are also known by the name of fin or feather bones. In young cattle these bones are red and porous in structure and the buttons are soft. The buttons become increasingly hard with advancing maturity.

Aged Carcasses

Carcasses from old animals are generally rough in contour and the chine bones (backbones) are white, hard, and flinty, with no cartilaginous tips.

Stated briefly, red, porous bone indicates youth; white, flinty bone indicates age.

Sex

Steer carcasses are identified by the presence of cod fat, the white pizzle ring at the posterior end of the aitchbone, and the shape of the exposed face of the gracilis muscle. Another outstanding sex difference is the enlargement on the end of the shin bone. Steer carcasses also lack the angularity of the heifer and cow carcasses and have a small pelvic opening.

Fig. 23.1—Steer carcass. The cod fat to the left; the half-closed face of the gracilis muscle and the pizzle ring at the right of the aitchbone identify this as a male.

Fig. 23.2—Heifer carcass. Note the presence of the udder and the exposed face of the gracilis muscle above the aitchbone.

Cow carcasses are identified by the absence of the udder and the large pelvic opening (larger in cows than in heifers). They are more angular, the ends of the fore shanks are slim and rather straight, without the decided enlargement characteristic of steer carcasses. Cow carcasses lack the thickness of muscling, particularly over the chuck, and show yellow fat. Heifer carcasses are identified by the presence of the udder and the shape of the exposed surface of the gracilis muscle.

Bull carcasses are recognized by the heavy fore quarter, thick neck, and the dark red color of the flesh.

CARCASS LAMB AND MUTTON

Lamb carcasses are recognized by the presence of the break or lamb joint on the forelegs. This joint is flat with four grooves in its surface. The joint is red and porous in lamb and rather white in yearlings (12 to 20 months). Sex in lamb carcasses is of no consequence.

Mutton carcasses may or may not be larger than lamb carcasses. They are recognized by the presence of the round or spool joint at the end of the foreleg. The outside flank muscle is generally reddish in color compared to the pink color of the same muscle on lamb.

*Ewe mutton carcasses are recognized by the large bung cav*ity, the pot belly, and the presence of the dugs (udders).

Stag and buck carcasses of mutton are rather heavy in the fore saddle and neck and show a small bung opening.

VEAL AND CALF CARCASSES

Weight is the main identification feature. Carcasses to be classed as veal should not weigh less than 60 pounds, nor more than 160 pounds, and should possess the characteristic pale pink or rose-pink color. There is no appreciable external fat covering.

Calf carcasses are from animals that have passed the veal stage and range in weight from 150 to 300 pounds. They have taken on more of the red color of beef.

HOG CARCASSES

Sex is ignored in barrows and gilts, but sows and stags are readily identified.

Sows show heavy bellies and large mammary gland development.

Stags show exceptional size and heavy shoulders.

Since practically all hogs are marketed at from 8 to 12 months of age, the age factor is of no consequence except as it pertains to sows and stags.

COACHING A TEAM FOR MEAT IDENTIFICATION

Charts, showing the location of the wholesale and retail cuts of a carcass, are of value in memorizing the location of the cuts in the carcass. The study of photographs for identification of cuts is of doubtful value. Whether purchaser or student, it is absolutely necessary that they come in direct contact with the product, either through actual purchasing, by learning the cuts through meat displays, or by doing the actual cutting. It is rather useless for vocational schools to enter meat judging or meat identification teams in national contests with no coaching other than from photographs.

Suggested Coaching Methods

One of the most effective ways of securing the necessary training is to place each boy with a competent and interested meat retailer, as a helper for certain hours during the week, with the understanding that the boy be given every opportunity to learn the names of the wholesale and retail cuts and help make them whenever convenient. The boy works with or without pay according to agreement. Several weeks or a month of such training for each boy will teach him more than is possible by any other method.

Another method that is more convenient but not as fruitful is where arrangements are made with one or more meat retailers to give the pupils practice in identifying available cuts one evening a week.

Still another method that can be employed with some degree of satisfaction is where the coach makes frequent shopping tours with one or two members of the class to engage in identifying showcase display cuts. Under this method, it is of course a prerequisite that the instructor must know his meats. More than two pupils in a group is unwieldy and may crowd the otherwise already busy shop.

Under any system of coaching, a list of the cuts as published by the National Congress of Vocational Agricultural Students

should be used so there will be no time lost in identifying cuts other than those indicated on the chart.

Where there are more trained contestants than the number required to constitute a team, an elimination contest can be arranged by the meat department of the state agricultural college.

Identification Features

The first task that confronts a contestant is that of determining whether the cut is beef, pork, veal, or lamb. These four kinds of meat are recognized by:

1. *Color of the lean.*
   Beef varies from bright to dark red.
   Lamb is light pink. Mutton is brick red.
   Pork is gray-pink to gray-red.
   Veal is pinkish brown. The older the veal, the more it borders on reddish brown.

2. *Size of the cut.*
   Beef cuts are large in size.
   Lamb cuts are small in size.
   Pork and veal cuts run similar in size.

3. *Type of fat.*
   Beef has a white or cream-white (yellow in the lower grades), firm, and rather dry fat.
   Lamb has a chalk-white, brittle, rather dense fat.
   Pork has a characteristic white, greasy fat.
   Veal is readily recognized by the absence of fat.

Having identified the cut as to kind, the next task is to identify the cut, both as to name and as to the wholesale cut from which it is derived. This requires a familiarity with anatomy to determine location by the shape of the bone and the shape and contour of the muscles. The contestant must remember that the difference between a roast and a steak of the same name is one of thickness. Steaks are generally from one-half to one and one-half inches thick, whereas roasts are over two inches thick.

MEATS CONTESTS FOR VOCATIONAL STUDENTS

Competition is undoubtedly one of the greatest instruments for arousing interest among young people. It has proved so effective among the youth of the nation that it has actually become a

so-called final examination for many courses offered in schools and colleges.

This method of fostering interest in the farm youth of the United States has been applied by the Future Farmers of America and the 4-H Club Congress to various phases of their work. Contests of national importance that have to do with meat consist of (1) the Meat Judging Contest (judging for quality), and the Meat Identification Contest held for Future Farmers of America at the American Royal Livestock Show at Kansas City, Missouri, and (2) a similar contest held by the 4-H Club Congress at the International Livestock Exposition at Chicago.

MEAT PLACING CARD

Class Name____________________Class No.__________

Contestant Name____________________Contestant No.__________

Placings: 1st______ 2nd______ 3rd______ 4th______

Tabulator's Score__________

Note: When placing carcasses and wholesale cuts of meat consideration is to be given to conformation, finish, and quality. Perfect score is 50 points.

The Meat Judging Contest requires the contestant to judge six classes of carcasses or wholesale cuts instead of the nine classes used in intercollegiate competition. These classes consist of (1) one class of four beef carcasses; (2) one class of four wholesale cuts of beef; (3) one class of four pork carcasses; (4) one class of four wholesale cuts of pork; (5) one class of four lamb carcasses; and (6) one class of four veal carcasses. (See Chapter XXII for information on judging.)

There are three contestants to a team, and each contestant is allowed 10 minutes for making the placings and filling in the official placing card.

The Meat Identification Contest is for the purpose of determining the contestant's knowledge of the various cuts of meat and the edible by-products of meat-producing animals.

Each contestant is given a meat identification card upon which are the names of 131 different retail cuts or edible meat by-products listed under the respective wholesale cuts from which they originate. A group of 25 retail cuts constitute this class, the cuts being numbered from 1 to 25 consecutively. The contestant must write the number of the cut opposite the name of that cut on the score card in the column designated for that purpose.

Each contestant is allowed 20 minutes for identification. Three contestants compose a team, and the same team or a different team may be in each contest.

One point is given for each cut that is correctly identified as to its wholesale trade name, and three additional points are given if its retail trade name is correctly identified, making 100 points for a perfect score.

Contestant number. ______

MEAT IDENTIFICATION CARD

BEEF

Wholesale Cuts	Retail Cuts	No.	Score
Round	Round steak		
	Top round steak		
	Bottom round steak		
	Eye round steak		
	Tip roast		
	Tip steak		
	Heel of round		
	Hind shank		
Rump	Standing rump		
	Rolled rump		
Sirloin (Loin end)	Sirloin steak		
	Pinbone sirloin steak		
	Beef butt tenderloin steak		
Short loin	Porterhouse steak (T-bone)		
	Club steak		
	Tenderloin		
Flank	Flank meat		
	Flank steak		
Rib	Standing rib		
	Rolled rib		
	Rib steak		
Chuck	Arm pot roast		
	Arm steak		
	Blade pot roast		
	Blade steak		
	Neck pot roast (bone in)		
	Boneless neck pot roast		
	Shoulder clod		
	Inside chuck roll		
Short plate	Plate (bone in)		
	Rolled plate		
	Short ribs		
Brisket	Brisket (bone in)		
	Boneless brisket		

MEAT IDENTIFICATION CARD (Continued)

Fore shank	Fore shank		
	Shank cross cuts		
Kidney knob	*Kidney suet*		
Corned beef	Boneless brisket		
	Plate		
	Rump		
	Round		
Dried beef	Chipped beef		
	Score		

PORK (Fresh)

Wholesale Cuts	Retail Cuts	No	Score
Fresh ham (leg)	Fresh ham (leg) butt half		
	Fresh ham (leg) shank half		
	Fresh ham (leg) boneless		
	Fresh ham (leg) center cut steak		
Loin	Loin roast center cut		
	Sirloin roast (ham end)		
	Blade loin roast (shoulder end)		
	Boneless loin roast		
	Rib chop		
	Loin chop		
	Tenderloin		
Fresh side (belly)	Fresh side pork		
Spareribs	Spareribs		
Fresh Picnic shoulder	Fresh Picnic shoulder		
	Arm roast		
	Arm steak		
	Shoulder hock		
Boston butt	Boston butt		
	Blade steak		
Fresh jowl	Fresh jowl square		
Fat	Fresh fat back		
	Fresh clear plate		
	Leaf fat		
Bones	Backbones		
	Neck bones		
	Score		

MEAT IDENTIFICATION CARD (Continued)

PORK (cured and smoked)

Wholesale Cuts	Retail Cuts	No.	Score
Smoked ham	Ham, butt end		
	Ham, shank end		
	Center ham slice		
Smoked shoulder	Smoked Picnic shoulder		
	Smoked shoulder butt		
Bacon	Slab bacon		
	Sliced bacon		
	Jowl bacon square		
	Canadian style bacon		
	Sliced Canadian style bacon		
Salt pork	Salt pork		
	Score		

LAMB

Wholesale Cuts	Retail Cuts	No.	Score
Leg	Leg		
	Boneless sirloin roast		
	Sirloin chop		
Loin	Loin roast		
	Loin chop		
Rack	Rib roast		
	Rib chop		
Shoulder	Square cut shoulder		
	Cushion shoulder		
	Rolled shoulder		
	Arm chop		
	Blade chop		
	Neck slice		
Breast	Breast		
	Riblets		
Fore shank	Shank (trotter)		
	Score		

MEAT IDENTIFICATION CARD (Continued)

VEAL

Wholesale Cuts	Retail Cuts	No.	Score
Leg	Half leg, shank half		
	Half leg, rump half		
	Standing rump roast		
	Round steak (cutlet)		
	Heel of round		
	Hind shank		
Loin	Sirloin steak		
	Loin roast		
	Loin chop		
	Kidney chop		
Rib	Rib roast		
	Rib chop		
Shoulder	Arm roast		
	Arm steak		
	Blade roast		
	Blade steak		
	Rolled shoulder		
	Neck (bone in)		
Breast	Breast		
	Riblets		
Fore shank	Fore shank		
	Score		

VARIETY MEATS

Kind		No.	Score	Kind		No.	Score
Heart	Beef			Liver	Beef		
	Veal				Veal		
	Pork				Pork		
Tongue	Beef or Veal				Lamb		
	Pork			Kidney	Beef		
	Lamb				Veal		
Beef tail or ox joints					Pork		
Beef tripe					Lamb		
Sweetbreads					Score		
Brains							

DIRECTIONS TO CONTESTANT

1. Twenty-five retail cuts are selected from the list on this score card and given serial numbers.
2. Contestant will write number of cut opposite the name of that cut on score card under column headed "No."
3. Contestant is warned to be sure to have recorded all numbers 1 to 25 inclusive.
4. Do not make any entries in column headed "Score" as that is for the judges only.

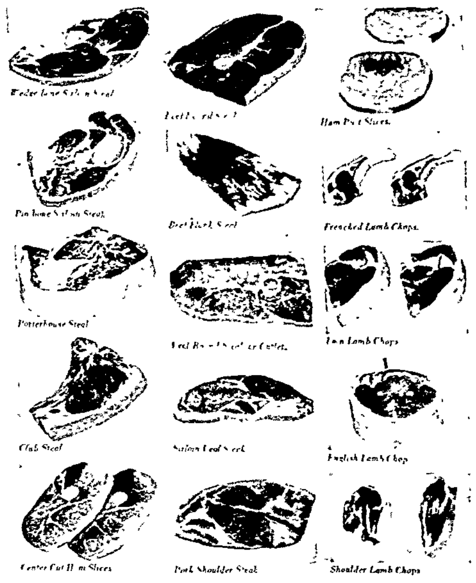


Fig. 23.3—1—Cuts to broil. 2—Steaks for braising. 3—Cuts to broil.

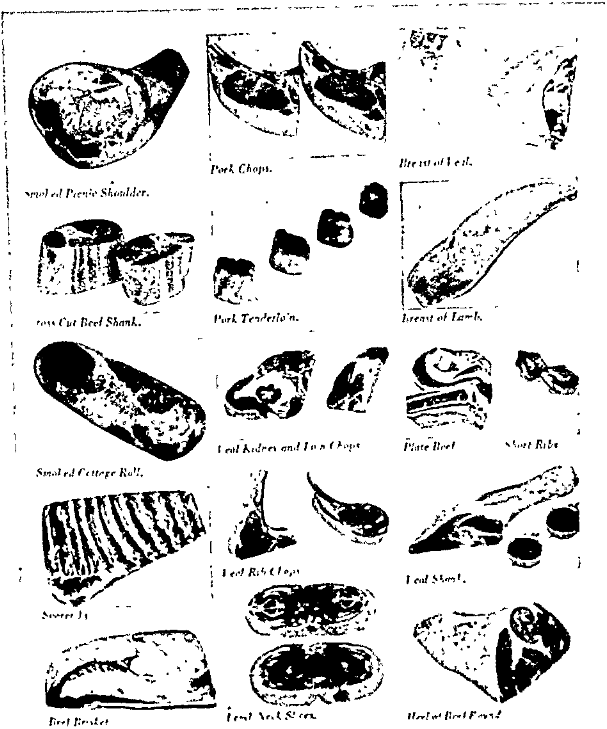


Fig. 23.4—1—Cuts to be cooked in water. 2—Cuts for braising. 3—Cuts used for stews.

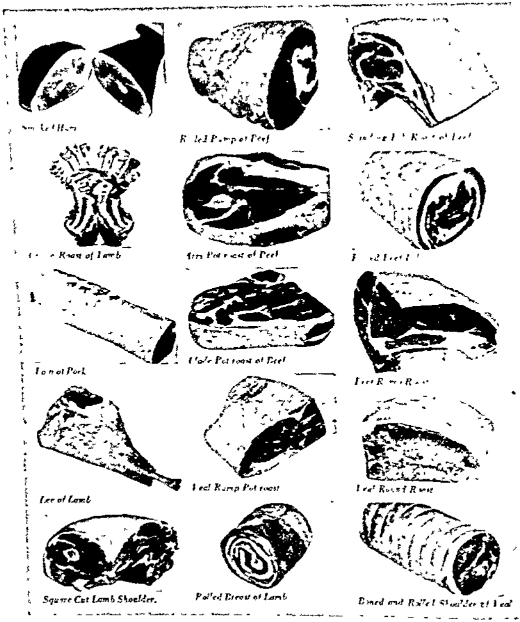
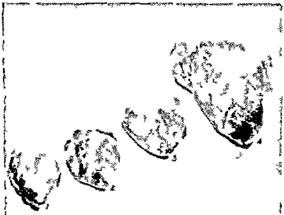


Fig. 23.5—1—Oven roasts. 2—Pot roasts. 3—Roasts.



Hearts

1. Lamb
2 Pork
3. Veal
4. Beef

Kidneys

1. Veal
2. Beef
3 Lamb
4 Pork

Livers

1. Beef
2 Lamb
3 Pork
4 Veal

Tongues

1. Beef
2. Veal
3. Pork
4 Lamb

Fig. 23 C—

APPENDIX
ORGANIZATIONS THAT PROMOTE MEAT

The meat industry, which now ranks third in total cash volume of business to the steel industry and the automobile industry, at one time did a greater volume of business than the other two combined.

Per capita meat consumption in this country has varied considerably. Although the people of the United States were never heavy meat eaters when compared to some of their Latin American neighbors, they reached a new low of 117 pounds (exclusive of lard) per person in 1935. Previous to 1910 the annual per capita meat consumption was 152 pounds, not counting lard.

Dealing for years in a very popular though highly perishable food product, the producers and processors were satisfied to meet consumer demand without much fanfare or high pressure advertising until the 1920's. Then new food products and some meat substitutes began to find their way into homes, and suddenly the meat industry discovered that it was losing ground. These competitive food interests, along with a growing number of diet cranks and food faddists, were telling the public that meat was injurious to health; that it was the cause of certain diseases and ailments, among which were high blood pressure, gout, rheumatism, hardening of the arteries, and Bright's disease. This condition made it necessary for the agencies interested in meat production and distribution to get together and work out a program to combat this propaganda, and not only to champion the cause of meat but to discover some of the nutritional possibilities of their product. As a result, the National Livestock and Meat Board was organized in 1922.

THE NATIONAL LIVESTOCK AND MEAT BOARD

The Board was unique in that every branch of the industry was given representation. Seventeen members were elected to the

original board and this number was later increased to 31, of which 16 represent livestock growers and feeders, 6 represent livestock marketing agencies, 5 represent the meat packing industry, 3 represent the nation's meat retailers, and 1 represents the restaurateurs.

It became apparent from the beginning that one of the real needs for combating anti-meat propaganda was more information on the food value of meat. Since this necessitated further research, the Board, working through the National Research Council, made grants for research at leading universities. Dr. E. B. Forbes headed the committee which in 1924 selected and formulated the Board's first research projects.

Research Program Highlights

Some of the results of this program have been (1) the findings of Dr. George H. Whipple at the University of Rochester which led to the discovery of the value of liver in the prevention and treatment of anemia; (2) the work of Dr. L. K. Campbell at Rush Medical College that established the importance of meat in weight-reducing and weight-gaining diets; (3) the evidence secured by Dr. R. S. Herzog at the University of Chicago that revealed the desirability of meat in the diet of children; (4) the discovery by Dr. George O. Burr at the University of Minnesota that lard is an important source of factors which promote growth and contains essential fatty acids valuable in proper nutrition; and (5) the discovery by Dr. C. A. Elvehjem at the University of Wisconsin that meat is a rich source of thiamin, riboflavin, and nicotinic acid.

In 1924 the Board was responsible for initiating a meat research project known as the National Cooperative Meat Investigations for the purpose of determining the factors which influence quality and palatability in meat. A committee of five selected to plan this project was headed by Dr. F. B. Mumford, then Director of the Missouri Experiment Station. This project is very extensive, involving all the steps from the production of meat animals to the preparation of meat for the table. It has been in progress at a score or more of state agricultural experiment stations and the United States Department of Agriculture and is still active. Meat cookery is a very important phase of the work and through these studies many old cooking methods have been discarded and new ones adopted.

How the Board Operates

The organization, at this writing, consists of nine divisions, with each division head responsible to the General Manager. Mr. R. C. Pollock, who was taken out of county agent work to head the organization at its founding, retired in 1954 and was succeeded by Carl F. Neumann, who had been serving as Assistant Manager. The offices are located at 407 South Dearborn Street, Chicago 5, Illinois. The staff of the Meat Board is organized into nine specialized divisions, each responsible for specific areas of activity and all working together in a coordinated effort to further the cause of meat through a program of information, education, and research.

Home Economics, Merchandising, Nutrition, Homemakers Service, Industry Relations, Educational Services, Meat News and Data, Literature, and Research constitute the nine divisions. One of the most outstanding jobs done by this organization has been its formulation and distribution of meat recipe booklets, meat charts in color, the booklet entitled "Ten Lessons on Meat," merchandising manuals on beef, pork, and lamb (the most complete ever published; composites of many of the cuts appear in this text), the pamphlet on Meat Carving, the manuals on beef and lamb for army mess sergeants (a very complete picture demonstration for making boneless cuts for the army), and its different manuals for the guidance of those doing family or quantity cooking.

The Financial Set-up

The National Livestock and Meat Board receives its revenue from voluntary contributions made by livestock growers and meat packers, collected at the time the livestock is sold. These contributions amount to approximately 25 cents per single deck car made on the following basis: cattle 2 cents per head; hogs 2/3 cent per head; calves 2/3 cent per head; and sheep 2/5 cent per head; the packers in turn match these voluntary contributions. The program of the Board has been endorsed by 87 leading livestock associations of the country.

THE AMERICAN MEAT INSTITUTE

Organized as the American Meat Packers Association in 1906 to promote the interests of the meat packing industry, this group, representing the meat industry, was reorganized in 1919 under

the name of the Institute of American Meat Packers. Added emphasis was then placed on research and informational effort, and cooperation with livestock producers, meat distributors, and governmental agencies. For the sake of brevity and to be more descriptive of the organization's wide activities, the name was changed again in 1940 to the American Meat Institute.

Its membership includes about 350 companies here and abroad, and its staff consists of ten service departments made up as follows: (1) Research; (2) Public Relations; (3) Live Stock; (4) Packing House Practice and Research; (5) Waste Elimination; (6) Marketing; (7) Industrial Education; (8) Advertising; (9) Accounting; and (10) Purchasing Practice. The program of the Institute is administered under the supervision of committees of men in the meat packing industry who are specialists in their fields. It maintains offices at 59 East Van Buren Street, Chicago, Illinois.

Outside Activities of the Institute

In 1923 the American Meat Institute (then the Institute of American Meat Packers) established an Institute of Meat Packing at the University of Chicago, designated to conduct research, develop publications, and give instruction in meat industry subjects. Conducted jointly by the University and the American Meat Institute, it offers home study courses for men engaged in or planning to enter the industry. Courses in "Meat Merchandising" and "Managing Meat Markets," prepared by the Business Education Service of the United States Office of Education in cooperation with national retail meat and grocery trade associations and others, were inaugurated in 1941. These courses are offered by state and local boards of education in conjunction with the United States Office of Education under the provisions of the George-Deen Act. The courses were designed for the purpose of teaching the most approved practices of meat retailing, aiding in the development of trained salesmen, and assisting in the promotion of efficient meat market management.

Beginning in the autumn of 1940, a giant advertising campaign, sponsored by the Institute, was launched in which each ad had the Seal of Acceptance of the Council on Foods and Nutrition of the American Medical Assocition. The purpose has been mainly educational, telling (1) the facts about proteins, vitamins, and minerals supplied by meat; (2) showing housewives how to use

the thrifty cuts; and (3) suggesting new ways of serving various meats. The Institute has also made a special effort to help the retailer carry meat's nutrition message to his customers more effectively.

THE AMERICAN MEAT INSTITUTE FOUNDATION

The American Meat Institute Foundation is a non-profit organization affiliated with and located at the University of Chicago. It is the outgrowth of an all-industry research program initiated by the American Meat Institute in 1924 and maintained by that organization for more than two decades. Valuable scientific contributions were made in the processing and utilization of livestock products by the Research Laboratory of the Institute. This work demonstrated the practicality of industry group research and led the Institute to make a survey of the needs for an expanded research program and possible methods of achieving such expansion. In 1944, the Institute's Board of Directors, acting on the recommendation of the Institute staff, voted to sponsor the establishment of an independent, non-profit organization to carry out a program of research and education in livestock production, processing, and utilization. The Foundation was incorporated in 1944, and began operations on a moderate scale in 1947. In 1949, the Foundation moved into a new laboratory building on the campus of the University of Chicago. This structure is designed to meet the specific needs of the Foundation and, with equipment, represents an investment of about three-quarters of a million dollars. The funds for construction and equipment of the building were contributed by several hundred meat packing companies—ranging from the smallest to the largest—and by companies in allied industries.

Purpose

The Foundation was organized to carry out a broad and comprehensive program of research and education in the field of livestock production and processing, including the utilization of livestock products. In the latter connection, technological advances resulting from intensive research in other industries already have induced major displacements of important livestock by-products. Thus, if the livestock, meat, and by-products industries are to keep abreast of the advancing times, improved or more economical processing methods, new and improved pro-

s, and new uses for such products must be developed. Such rtant advancements, of course, can result only from connt and expanding attention to the types of fundamental arch and technological experimentation now being conducted ie Foundation.

iation with the University of Chicago

The Foundation's location in the heart of one of the great arch centers of the country and its affiliation with the Univer- of Chicago provide distinct advantages. There is opportunity exchange of scientific information between the Foundation f and scientists of the University, as well as with scientists iated with other research organizations on the campus. Some ndation staff members hold professional appointments in University. A number of graduate students are doing thesis k in the Foundation's laboratories under the supervision of se Foundation scientists.

An Advisory Committee, three members of which are apnted by the University and two by the Foundation, serve to ordinate the programs of the two institutions in such a man- as to obtain the maximum benefit to the public and to the perating institutions.

A Development Committee, with three members from the iversity and two from the Foundation, holds as trustees, for benefit of the public and the Foundation, any patents that y result from any invention or discovery in research financed the Foundation.

nancial Support

The Foundation was established, and in large degree is aintained, by voluntary financial support from the livestock d meat industry and others interested in the development of ientific information that will lead to improved utilization of vestock.

Such contributions are deductible by donors for income tax urposes, since the Foundation is a non-profit organization and ll income is used exclusively for scientific and educational puroses. Any bequests, legacies, devices, or transfers similarly re deductible in arriving at the value of the net estate of a deceent for estate tax purposes.

Provision has been made for the Foundation to render servce in research for industry, the Department of Agriculture, the

Department of Defense, and other governmental agencies. The Foundation conducts research for outside agencies in fields in which it can function most effectively because of its personnel, facilities, and experience. Grants and contributions for special research projects are accepted. Gifts and donations likewise are accepted in support of the purposes of the Foundation.

THE NATIONAL ASSOCIATION OF RETAIL MEAT DEALERS

The association of the retail meat dealers of the United States, combined under the slogan "One for All and All for One," has local organizations in 79 of the principal cities from coast to coast. Founded in 1885, the organization represents a large bulk of the total volume of business done by the approximately seventy thousand retail meat dealers in the United States. The organization is supported by dues from its membership and consists of a board of directors, a legislative committee, a trade relations committee, and a labor board committee. It has three member representatives on the National Livestock and Meat Board and has cooperated extensively in carrying to the public the message of the value of meat in nutrition.

OTHER AGENCIES

The Livestock Loss Prevention Board, various livestock and breed organizations, and the agricultural agents of public utilities firms are also active disciples of good meat, particularly from the standpoint of its production and its shipment and sale.

Undoubtedly the greatest agencies for discovering new facts about production, handling, preparation, and use of meat, and disseminating these facts to the public, are the various state colleges and universities and the United States Department of Agriculture. Although only a small proportion of the land grant colleges operate and maintain separate meat departments for research, most of them include some meat courses in their curricula. A number have whole or part time meat extension specialists who carry the facts directly to farmers.

THE RECIPROCAL MEAT CONFERENCE

In the autumn of 1947, Mr. R. C. Pollock, general manager of the National Livestock and Meat Board, addressed the coaches of the various meat teams in a meeting prior to the conclusion of

the International contest. He proposed the formation of an organization of the coaches of all intercollegiate meat judging teams and those engaged in the teaching and research of meats in the institutions of higher learning. The purpose of the organization would be to meet annually for a two day program devoted to the subject of meats in its many facets. This proposal was adopted.

The chairman for the first four meetings (1948-51) was Mr. W. H. Tomhave, who had served as head of the Animal Hubbandry Department of the Pennsylvania State College from 1912 to 1925 and as Secretary of the Aberdeen Angus Breeders Association from 1925 to 1945. The organization was designated as the "Reciprocal Meat Conference." It is wholly to the credit of Mr. Pollock and the National Live Stock and Meat Board that the conference came into being and its development sustained and implemented. The members of the conference have been appreciative of their sponsor and have helped to make it a conference of stature in the field of meats.

For the information of those who may some day participate in a meats contest or become members of the organization, the names of the past chairmen of the conference, selected yearly from a board of five members, are provided along with the "Service Award" winners and the team standings for the five sponsored Intercollegiate Meat Judging Contests.

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Results of the Intercollegiate Meat Judging Contests. 1926-1960.
International—Chicago, Illinois.

Inst.	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Clemson	—			—		—																									
Colorado	7	—	—			—																							11	25	24*
Connecticut	—		—	—		—	—																								
Cornell	—		—	—		—												13		17				21	10	18	22	24	25	6	21
Florida		—																						9	16	21	6	18	19	22	26
Illinois	10	6	4	8	7	5						5	7	11	2*	11										23	9	17	23	17*	13
[illegible]											12	12	11	15				11	8	5	9	7	7	12	13*	9	10	6	12	16	20
Iowa	2	1	5	2	8	2	3	2	7	3	10	3	2	14	10	5															
Kansas		3	2	4	6	1	4	6	1	2	9	10	5	2	5*	10	2*	3	9	2	2	1	4	3	3	1	1	5	3	8	1
Kentucky																	1	12	1	10	5	11	5	15	9	7	11	2	10*	5	8
Maryland																				19	12	9	2	6	4	17	12	20	18	24	5
Massachusetts							8	5	9	9	7	9	11	13		6								23							
Michigan																		10	11	18	4	17*	19	20	21	8	24	23	21	22	22
Minnesota	9							8	6	10	11	7	6	6*	13	7	11	7	6	9	19	13	8	8	7	19	8	11	6	12	19
Mississippi																	10	16	12	15	20	12	13	10*	11	11	7	13	11	21	10
Missouri	4	1	7	5	1	9				5	1		12	3	1	6													16*	19	15
Nebraska	1	9	1	3	2	4	2	3	2	1	1	1	1	8	1	2	6	9	13	11	8	3*	6	7	12	12	17	4	5	11	17
N. Carolina																		8	17	4	13	10*	11*	17	15	14	15	21	15	17*	18
N. Dakota		12															2*	6	14	21	11	15	16	18	20	20	13	9	20	7	9
Ohio			3	6	4																			19	17	13	14	14	24	3	14
Oklahoma	3	5	3*				1		8	11	8	6	3	10	9	13	5	1	2	13	6	16	3	2	13*	3	16	10	8	1	3
Ontario					3	8	7	9		8	3	9	4	5	2*	1	1	2	1	1	7	2	9	1	1	6	3	3	2	1	6
Pennsylvania	4	7	8*	1	9	3	9	1	4	6	2	4	10	12					3	16	17	3*	18	23	22	22	20		22	26	
S. Dakota	3	2	6	7		7	5	7	5	4	5	11	4	1	11	12	8	15	15	20	15	19	20	13	18	10	1	15	10	10	16
Tennessee								4	3	7	6	2	13	9	7	4	7	4	10	14	16	5	10	10*	19	15	21	8	9	9	11
Tex. A. & M.																			16	6	10	17*	11*	14	5	5	18	13	11	11	4
Tex. Tech.														6*	8	3			5	13	14	14	14	16	6	4	5	7	1	2	12
Virginia																				7	18	20	15	5	8	16	23	10			24*
W. Virginia		10		9	3	6	8																				19	16	7	13	23
Wisconsin		11													12	14	12	14	14	8	1	8	17	21				22		15	7
Wyoming	9	9											9	1	5*	9	9	5	7	3	3	6	1	1	3	1	2	1	4	20	2

*Tie

Past Chairmen of the Reciprocal Meat Conference

1948 – 1951	W. H. Tomhave
1952	R. W. Bray, University of Wisconsin
1953	J. W. Cole, University of Tennessee
1954	L. E. Waters, Oklahoma State University
1955	E. A. Kline, Iowa State University
1956	A. M. Pearson, Michigan State University
1957	T. N. Blumer, North Carolina State College
1958	V. R. Cahill, Ohio State University
1959	C. H. Adams, University of Nebraska
1960	G. H. Wellington, Cornell University

Recipients of the Reciprocal Meat Conference Awards for Signal Service in the Field of Meats

Sleeter Bull, University of Illinois	1956
J. B. Francioni, Jr., Louisiana State University	1956
K. F. Warner, U. S. Department of Agriculture	1956
P. T. Ziegler, Pennsylvania State University	1956
P. A. Anderson, University of Minnesota	1957
J. L. Hall, Kansas State College	1957
R. C. Pollock, N.L.S.M.B.	1957
F. J. Beard, U. S. Department of Agriculture	1958
E. C. Stillwell, Ontario Agricultural College	1958
W. J. Loeffel, University of Nebraska	1958
D. L. Mackintosh, Kansas State College	1960
R. B. Davis, N.L.S.M.B.	1960

Results of the *Intercollegiate* Meat Judging Contests—1927-1960.
American Royal—Kansas City, Missouri

Inst.	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Illinois	1	2	1	5	3						8	8	2	6	9		7	14	4	5*	3	7	13	13	14	15	10	10	15	14
Illinois Normal												11																		
Iowa	3	3	3	1	2	2	1	2	6	4	5	10	8	10	6	5	10	8	6	1	7	9	6	5	6	4	9	5	3	4
Kansas	4	4	2	2	1	1	2	3	4	5	3	4	6	9	7	2	8	4	5	4	6	13	15	9	8	9	5	3	1	1
Kentucky																				14		14	3	8	10	10	8	7	12	13
Michigan																	9	2*	10	13							13	9	10	18
Minnesota							4	1	3	3	4	9	7	7	2							11	11	6	13	7	17	13	17	7
Mississippi																												16	11	16
Missouri	2	1	5	3	4	3	3	5	1	2	6	6	1	8	8	6	5	11	14	9	8	4	2	2	7	12	7	8	7	11
Nebraska	5		4	4						1	1	1	4	3	3		6	10	11	10	11	10	8	11	15	13	14	6	13	10
North Dakota																									12	11	12	18	16	15
Ohio																	4	5	3	8	10	5	5	10	5	3	6	12	8	9
Oklahoma	6	6					5	4	5	6	2	5	3	1	1	1	3	2*	1	5*	1	1	4	4	2	6	4	1	3	2
Panhandle														11																
Pennsylvania			6		5	4			2	7		7	9	2	5	7		13	12	11		15	14	15	11	2	11	17	14	17
South Dakota	8	5									7	2	5	5	4	3	2	6	7	2	5	9	12	14	16	16	16	14	9	6
Tennessee																		7	9			8	7	1	1	8	1	11	6	9
Texas A. & M.												3						9	8	7	4	3	9	7	4	5	2	4	2	5
Texas Tech																		12	13	12	9	12	10	12	9	14	15	13	15	13
Wisconsin														4		4	1	1	2	3	2	2	1	3	3	1	3	2	4	3
Wyoming	7																					—	—	—	—	—	—	—	—	—

*Tie

Results of the Intercollegiate Meat Judging Contests—1927-1960.
American Royal—Kansas City, Missouri

Inst.	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941
Illinois	1	2	1	5	3						8	8	2	6	9
Illinois Normal												11			
Iowa	3	3	3	1	2	2	1	2	6	4	5	10	8	10	6
Kansas	4	4	2	2	1	1	2	3	4	5	3	4	6	9	7
Kentucky															
Michigan															
Minnesota							4	1	3	3	4	9	7	7	2
Mississippi															
Missouri	2	1	5	3	4	3	3	5	1	2	6	6	1	8	8
Nebraska	5		4	4						1	1	1	4	3	3
North Dakota															
Ohio															
Oklahoma	6	6					5	4	5	6	2	5	3	1	1
Panhandle														11	
Pennsylvania			6		5	4			2	7		7	9	2	5
South Dakota	8	5									7	3	5	5	4
Tennessee															
Texas A. & M.												3			
Texas Tech															
Wisconsin														4	
Wyoming	7														

Inst.	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Illinois		7	14	4	5*	3	7	13	13	14	15	10	10	15	14
Illinois Normal															
Iowa	5	10	8	6	1	7	8	6	5	6	4	9	5	5	4
Kansas	2	8	4	5	4	6	13	15	9	8	9	5	3	1	1
Kentucky					14		14	3	8	10	10	8	7	12	12
Michigan		9	2*	10	13							13	9	10	18
Minnesota							11	11	6	13	7	17	13	17	7
Mississippi													16	11	16
Missouri	6	5	11	14	9	8	4	2	2	7	12	7	8	7	11
Nebraska		6	10	11	10	11	10	8	11	15	13	14	6	13	10
North Dakota										12	11	12	18	16	15
Ohio		4	5	3	8	10	5	5	10	5	3	6	12	8	9
Oklahoma	1	3	2*	1	5*	1	1	4	4	2	6	4	1	3	2
Panhandle															
Pennsylvania	7		13	12	11		15	14	15	11	2	11	17	14	17
South Dakota	3	2	6	7	2	5	9	12	14	16	16	16	14	9	6
Tennessee			7	9			6	7	1	1	8	1	11	6	8
Texas A. & M.			9	8	7	4	3	9	7	4	5	2	4	2	5
Texas Tech			12	13	12	9	12	10	12	9	14	15	15	18	13
Wisconsin	4	1	1	2	3	2	2	1	3	3	1	3	2	4	3
Wyoming															

*Tie

Results of the Intercollegiate Meat Judging Contests—1938-1961. Southwestern Exposition—Fort Worth, Texas.

Inst.	1938	1939	1940	1941	1942	1946	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Abilene Chr.														9			14		
Arizona																		13	
Cal. Poly																	13	10	
Iowa									3		2	4	5	5	2	4	9	5	2
Kentucky												5		3	5	8	7	8	10*
Kansas								4			4		6		3	3	1	3	1
Louisiana	3	3	3																
Mississippi																	11	12	10*
Missouri												6							
Nebraska				1	1	1	4				7	7				10*	4	7	
New Mexico																10*	12	14	8
Oklahoma	2	2	1	2	3	2	1	1	1	1	1	1	2	1	6	1	3	2	5
Panhandle			4	4															
North Dakota																			9
South Dakota											8	9	8	8	9	5	6	9	1
Tennessee												3	3	4	7	9	8	6	3
Tex. A & M	1	1	2	3	2	4	5	2	4	4	6	8	4	6	4	2	2	4	7
Tex. Tech	1	4	5	5	4	3	2	5	5	2	5	10	7	7	8	7	10	11	
Wisconsin							3	3	2	3	3	2	1	2	1	6	5	1	6

*Tie

Results of the Intercollegiate Meat Judging Contests, 1926-1962.
Eastern National—Baltimore, Maryland

Inst.	'50	'51	'52	'53	'54	'55	'56	'57	'58	'59	'60
Clemson	.	. .	.					.	12	9	10
Connecticut			.	5	7	5	7	12	9	10	6
Cornell	.	. .	.	7	1	6	8	8	2	5	5
Florida.	. .	.	. .					11	5	7	11
Kentucky.	. .	6						7			13
Maryland	5	8	6	4	8		10		13	13	14
Massachusetts.	7	4		8	9	9	9		7	11	8
Michigan	.	.	7	3	3	4	4	6	3	3	2
North Carolina .	2	3	5	9	4	7	3	1	8	8	7
Ohio.	1	2	2	2	5	3	5	5	10	2	1
Pennsylvania	3	7	3	6	6	2	2	2	4	4	4
Rutgers		.				.		9	6		. .
Tennessee	6	5		. .	.	8					
Virginia Poly.				.	.	10	6	4	11	6	9
West Virginia	4	1	4	10	.	. .		10		12	12
Wisconsin			1	1	2	1	1	3	1	1	3

Results of the Intercollegiate Meat Judging Contests—1960.
Pacific International—Portland, Oregon.

Inst.	'60											
Brigham Young	5											
California Poly	2											
Fresno State	3											
Univ of Idaho	7											
Montana State	4											
Oregon State	6											
Washington State	1											

Rank of States in Live Weight of Farm Production of Meat Animals, 1960.[1]

Rank	Cattle and Calves: State	Cattle and Calves: Production	Sheep and Lambs: State	Sheep and Lambs: Production	Hogs: State	Hogs: Production
		Mil lb.		Mil lb.		Mil lb.
1	Texas	2,714	Texas	190	Iowa	4,329
2	Iowa	2,444	California	115	Illinois	2,640
3	Nebraska	1,631	Wyoming	109	Indiana	1,692
4	Kansas	1,458	Colorado	107	Minnesota	1,343
5	Illinois	1,407	Iowa	105	Missouri	1,331
6	California	1,399	South Dakota	98	Ohio	889
7	Minnesota	1,368	Idaho	90	Nebraska	861
8	Missouri	1,260	Montana	88	Wisconsin	709
9	South Dakota	1,161	Minnesota	75	South Dakota	559
10	Oklahoma	1,107	Utah	63	Kentucky	415
11	Wisconsin	951	Oregon	52	Georgia	414
12	Colorado	830	Ohio	51	North Carolina	394
13	Montana	787	Missouri	47	Tennessee	397
14	Indiana	657	Nebraska	45	Kansas	385
15	Ohio	558	North Dakota	45	Texas	296
16	North Dakota	558	Illinois	43	Alabama	277
17	Kentucky	535	New Mexico	43	Michigan	252
18	Mississippi	521	Kansas	39	Virginia	198
19	Tennessee	468	Kentucky	34	Pennsylvania	163
20	Alabama	453	Indiana	31	Mississippi	143
21	Idaho	446	Washington	22	South Carolina	140
22	Michigan	440	Michigan	21	Oklahoma	136
23	Pennsylvania	420	Arizona	29	North Dakota	131
24	Oregon	411	Virginia	19	Arkansas	128
25	Louisiana	409	West Virginia	16	California	88
26	New York	394	Nevada	16	Florida	85
27	New Mexico	385	Wisconsin	15	Colorado	62
28	Wyoming	378	Oklahoma	14	Louisiana	59
29	Virginia	365	Tennessee	12	Oregon	53
30	Arkansas	349	Pennsylvania	11	Maryland	52
31	Washington	341	New York	8	Montana	49
32	Georgia	319	North Carolina	2	Washington	47
33	Florida	306	Maryland	2	Idaho	44
34	Arizona	276	Maine	2	New York	43
35	Utah	214	Louisiana	2	West Virginia	35
36	North Carolina	194	Arkansas	2	Massachusetts	29
37	Nevada	157	Mississippi	2	New Jersey	25
38	West Virginia	131	Alabama	1	Utah	18
39	Maryland	124	New Jersey	1	New Mexico	16
40	South Carolina	113	Georgia	1	Delaware	10
41	Vermont	66	Massachusetts	1	Wyoming	9
42	New Jersey	44	Vermont	1	Arizona	8
43	Maine	37	Delaware	[2]	Maine	7
44	Connecticut	30	New Hampshire		Connecticut	5
45	Massachusetts	27	South Carolina	[2]	New Hampshire	4
46	New Hampshire	13	Connecticut	[2]	Vermont	3
47	Delaware	12	Florida	[2]	Nevada	3
48	Rhode Island	4	Rhode Island	[2]	Rhode Island	2
United States		28,706		1,660		18,999

[1]Live weight produced during year by livestock on farms. Preliminary data.
[2]Less than 500,000 pounds.

Maximum Loading for Livestock.

Hogs & Calves
Single-Deck Trucks

Floor Length	100 lb.	150 lb.	175 lb.	200 lb.	225 lb.	250 lb.	300 lb.	350 lb.	400 lb.
8 ft	27	21	19	18	16	14	13	11	9
10 "	33	26	24	22	20	18	16	14	12
12 "	40	31	28	26	24	22	19	17	14
15 "	50	39	36	33	30	27	24	21	17
18 "	60	47	43	40	36	33	28	25	21
20 "	67	52	48	44	40	35	32	28	24
24 "	80	62	57	52	48	44	38	34	28
28 "	93	72	67	61	56	51	44	39	33
30 "	100	77	72	66	60	55	47	42	35
32 "	107	83	76	70	64	58	51	44	38
36 "	120	94	86	79	72	66	57	50	42
42 "	140	109	100	92	84	77	63	55	49

Divide Equally for Double-Deck Trucks

Floor Length	100 lb.	150 lb.	175 lb.	200 lb.	225 lb.	250 lb.	300 lb.	350 lb.	400 lb.
8 ft	43	33	31	29	27	24	21	18	16
10 "	53	41	38	36	33	30	26	23	20
12 "	63	50	46	43	40	36	31	28	24
15 "	79	62	56	54	50	45	39	34	30
18 "	95	75	70	65	60	55	46	41	36
20 "	105	83	77	72	67	61	52	46	40
24 "	127	100	93	87	80	73	62	55	48
28 "	148	116	109	101	93	86	73	64	56
30 "	158	125	116	108	100	91	78	68	60
32 "	169	133	130	115	107	97	83	73	64
36 "	190	150	140	130	120	110	94	82	72
42 "	220	172	164	151	142	128	109	96	80

Cattle

Floor Length	450 lb.	600 lb.	800 lb.	1000 lb.	1200 lb.	1400 lb.
8 ft	8	7	5	4	4	3
10 "	10	8	7	6	5	4
12 "	13	10	8	7	6	5
15 "	16	13	10	9	8	7
18 "	20	16	13	11	9	8
20 "	22	18	14	12	10	9
24 "	27	22	17	15	13	11
28 "	31	25	20	17	15	13
30 "	34	27	22	19	16	14
32 "	36	29	23	20	17	15
36 "	41	33	26	22	19	17
42 "	48	39	31	28	22	20

Sheep
Recommended Load per Deck

Floor Length	60 lb.	80 lb.	100 lb.	120 lb.
8 ft	28	23	20	18
10 "	35	29	26	23
12 "	43	35	31	28
15 "	54	45	40	36
18 "	65	54	48	43
20 "	73	60	54	48
24 "	88	73	65	58
28 "	103	85	76	68
30 "	110	92	81	73
32 "	118	98	87	78
36 "	133	110	98	88
42 "	145	128	115	103

Partition each class of livestock   It's a sound investment.

Champion Steer or Heifer Carcasses (International), by Years.

Year	Animal	Owner	Breed	Live Wt.	Dressing Pct.	Sale Price
1903	College Lad	Iowa State College	Angus	1215	67.16	.15
1904	Funk's Choice	Funk Bros., Illinois	Gr. Angus	1235	65.70	.15
1905	College Lad	Iowa State College	Angus	1250	64.83	.15
1906	Exhibo	C. J. Off, Illinois	Angus	1760	69.50	—
1907	Squire Good	C.L. Taggart, Penn.	Gr. Angus	1096	63.95	.17½
1908	Ben H	D. Bradfute & Son, Ohio	Angus	1365	67.47	.15
1909	LaPreto	Univ. of Nebraska	Angus	1490	66.80	.17¼
1910	Crown	C. L. Taggart, Penn.	Gr. Angus	1010	66.43	.21½
1911	Model	M.L. McCoy, Ohio	Angus	1150	67.50	.19
1912	Prince of Viewpoint 5th	Univ. of Neb.	Angus	1290	67.13	.15¼
1913	Star of North	Univ. of Minnesota	Angus	1502	66.97	.27½
1914 - 1915	No Show					
1916	Ohio's Twin	Ohio State University	Angus	1376	63.08	.40
1917	Pandean Jr.	Iowa State College	Angus	1185	66.55	.41½
1918	White Sox	Iowa State College	Gr. Angus	1270	63.54	.31
1919	Black Robin	Iowa State College	Angus	1165	63.90	.99
1920	Black Rock 3rd	Iowa State College	Angus	1250	65.84	.77
1921	College Erin	Mich. Agri. College	Angus	1110	62.52	.65
1922	Yankee Pride	C. L. Taggart, Penn.	Gr. Angus	980	65.92	.65
1923	*Kinzo*	*John H. Fitch, Iowa*	Angus	1205	62.74	.37
1924	Elwood	Iowa State College	Angus	1208	65.29	.77
1925	Jock	W. W. Wilson & Son, Indiana	Angus	1040	64.03	7.00
1926	*Vim*	*University of Minnesota*	Angus	940	64.36	1.50
1927	Huerta of Hall Orchards	Hall Orchards, Mich.	Angus	1210	65.37	.45
1928		Benny Keith Collins	Gr. Angus	1160	62.24	6.75
1929	*Crestview Aladdin 2d*	*Fay Ljungdahl*	*Angus*	*1110*	63.25	.80
1930	College Pride 101st	University of Wis.	Shorthorn A. A.	855	61.73	1.25
1931	Max	University of Wisconsin	Angus	1270	65.59	.32
1932	*Colemere's Best*	*J. Omar Cole, Indiana*	Angus	1115	64.93	.27
1933		Shown by Russell Lebo, Remington, Indiana	Angus	1090	68.42	.51
1934		Shown by Raymond Mobley, Mt. Sterling, Illinois	Angus	1000	64.40	.29
1935		Shown by Betty Parkman, Aledo, Illinois	Angus	1023	64.91	.31
1936		Shown by Robt. O. Swaim, Marshall, Indiana	Angus	905	64.63	.65
1937		Shown by N. H. Streeter, New Windsor, Illinois	Angus	945	64.34	.95
1938		Shown by Roger Rowe, Dallas Center, Iowa	Angus	1071	63.77	.75
1939		N. H. Streeter, New Windsor, Illinois	Angus	1082	65.62	.60
1940	Kenneth Blan	Wapello, Iowa	Angus	1095	67.17	61
1941	*Guilford Hall*	*Oskaloosa, Iowa*	Angus	910	65.38	.44½
1942 - 1945	No award					
1946		T. J. Burg, Seota, Illinois	Angus	1020	67.94	3.50
1947		Purdue University	Angus	1130	64.49	1.25
1948		Shaw Bros.; Banner, Wyoming	Angus	982	64.22	1.00
1949		H. B. Held, Hinton, Iowa	Angus	1115	66.2	1.10
1950		Hamann & Wildish—Sundbury, Iowa	Angus	1114	68.39	1.02
1951		B. F. & Howard Held—Hinton, Iowa	Angus	1115	66.1	.60
1952		Harold Harper, Worthington, Indiana	Angus	1034	64.63	.58
1953		John Gill, Marian, Iowa	Angus	1110	67.0	1.00
1954		Golden Dawn Farms, Carthage, Indiana	Angus	1020	64.49	1.25
1955		Golden Dawn Farms, Carthage, Indiana	Angus	1015	65.5	1.25
1956		*Maurice Stenzel, Oseo, Illinois*	Angus	900	67.9	8.25
1957		Rule Bros. Mineral Point, Wisconsin	Shorthorn	960	62.1	6.00
1958		Larry McKee, Varna, Illinois	Angus	965	66.2	10.00
1959		*Harry May, Mineral Point, Wisconsin*	Angus	920	63.7	7.00

Goats Slaughtered Under Federal Inspection in the United States

1959	1956	1955	1954	1953	1952	1951	1950
192,099	85,735	86,519	86,201	20,229	29,878	46,047	67,950
1949	**1948**	**1947**	**1946**	**1945**	**1944**	**1943**	**1942**
197,626	258,091	144,132	87,377	13,150	6,619	13,624	24,655

Champion Barrow Carcasses (International), by Years.

Year	Owner	Breed	Live Wt	Dressing Pct.	Sale Price
1905	Cornell University Ithaca N Y	Cheshire	215	90 23	09
1906	John Francis & Sons New Lenox Illinois	Graded Poland	267	86 52	08½
1907	F E Bone Ava Illinois.	Grade Chester White	335	89 25	—
1908	J Francis & Sons New Lenox Illinois.	Grade Poland China	318	88 90	—
1909	J Francis & Sons New Lenox Illinois	Grade Poland China	318	85 54	—
1910	F E Bone Ava Illinois	Chester White	300	86 00	10½
1911	J Crouch & Sons Lafayette Indiana	Grade Hampshire	234	86 09	08½
1912	J Francis & Sons New Lenox Illinois	Cross Bred Poland China	214	81 30	09
1913	Ira E. Bryan Princeton Illinois	Poland China	300	92 00	12¾
1914-15	No show account of quarantine				
1916	University of Illinois.	Berkshire	441	87 39	13
1917	F E Bone Ava Illinois	P C Berk C W	200	84 00	28
1918	C L. Burgess & Son Bernet Illinois	Poland Chester	235	80 85	55
1919	Otto Schouboe Harlan Iowa.	Chester White.	180	77 78	21
1920	Iowa State College	Berkshire	247	79 76	19
1921	The Walnuts Tollula Illinois	Berkshire	295	79 32	25
1922	Iowa State College Ames, Iowa	Berkshire	470	85 50	14
1923	Michigan Agr College E. Lansing	Berkshire	415	80 50	18
1924	Otto Schouboe	Chester White	200	81 00	17
1925	Bluebank Farm Ridgeley Tennessee	Berkshire.	245	82 45	45
1926	Iowa State College	Berkshire	205	77 07	20
1927	I T Hickman & Son Ohio	Chester White	225	77 78	30
1928	Iowa State College	Berkshire	300	79 00	1 60
1929	Michigan State College	Berkshire	235	85 95	30
1930	Penn State College	Berkshire	345	73 04	30
1931	J H Nichel & Sons	Berkshire.	220	77 73	15½
1932	Emerson Littlejohn	Berkshire	200	77 00	12
1933	Otto Holle Decatur Indiana	Chester White	180	76 67	13
1934	Dale R. Williams Iowa City Iowa	Chester White	235	79 57	12½
1935	H K Hill Prairie Du Sac Wisconsin	Poland China.	286	76 22	20
1936	Penn State College	Berkshire	2 0	76 29	32
1937	Otto Holle Decatur Indiana	Chester White	181	75 14	26
1938	University of Minnesota	Chester White	238	81 09	15
1939	University of Illinois	Chester White	188	77 66	21
1940	Otto E Holle Decatur Indiana.	Chester White	199	81 91	12
1941	Michigan State College	Chester White	197	76 14	20
1942-45	No award				
1946	N L. Stuckman Nappanee Indiana	Berkshire	280	76 66	36
1947	Michigan State College	Berkshire	219	81 12	41
1948	Michigan State College	Chester White	215	76 28	40
1949	M V Wolrab Mt Vernon Iowa	Berkshire	285	70 7	36
1950	University of Wisconsin.	Poland China	238	71 42	55
1951	Ohio State University	Berkshire	210	64 76	
1952	Hollinger & Roberts McLean Illinois	Yorkshire	216	72 68	35
1953	Clyde Ackerman Morton Illinois	Yorkshire	210	72 86	45
1954	Purdue University	Poland China	195	73 33	84
1955	John Fox Shelbyville Indiana	Poland China.	212	74 5	30
1956	O Anderson & Son Leland Illinois	Poland China	202	73 2	8 00
1957	H Yake & Sons Cardington Ohio	Berkshire	230	73 9	10 00
1958	O Anderson & Sons Leland Illinois.	Poland China	230	76 5	6 00
1959	Car Bros McNabb Illinois	Hampshire	200	75 0	6 00

Champion Steers in Slaughter Contest—Judged on Foot.*

Year	Animal	Owner	Breed	Age	Live Wt.	Dressing Per cent	Carcass Rank	Carcass Price
1908	Blaylock	Minnesota Agricultural College	Aberdeen-Angus	2-Year-Old	1575	63.71	None	9 1/4
	Pride of Peoria	C. J. Off, Illinois	Aberdeen-Angus	Yearling	1410	66.53	None	10 3/4
1909	Jack of Estill	University of Missouri	Grade Angus	2-Year-Old	1600	66.60	None	11
	Quaint Fellow 4th	Charles J. Off, Illinois	Aberdeen-Angus	Yearling	1352	63.50	5	13 3/4
1910	Highland Laddy	University of Nebraska	P. B. Galloway	3-Year-Old	1673	63.55	2	11 1/4
	Prince of View Point	University of Nebraska	Aberdeen-Angus	Yearling	1274	66.05	2	12
1911	Matador	Iowa State College	Grade Hereford	2-Year-Old	1940	65.70	2	12
	Model	Mart L. McCoy, Ohio	Aberdeen-Angus	Yearling	1149	67.80	Champ.	19
1912	Prince of View Point 5th	University of Nebraska	Aberdeen-Angus	2-Year-Old	1290	67.13	Champ.	15 1/4
	Pennsylvania Pride	C. L. Taggart, Pennsylvania	Aberdeen-Angus	Yearling	1206	65.09	2	14
1913	Star of the North	University of Minnesota	Aberdeen-Angus	2-Year-Old	1592	66.97	Champ.	27 1/2
	Prince of View Point 7th	University of Nebraska	Aberdeen-Angus	Yearling	1278	66.74	2	14
1916[1]	Nitany	Pennsylvania State College	Aberdeen-Angus	2-Year-Old	1522	65.57	2	17
	Carranza	Iowa State College	Grade Angus	Yearling	1416		None	–
1917	Pansy	C. L. Taggart, Pennsylvania	Grade Angus	Yearling	1105	64.07	4	22
1918	Chieftain	C. L. Taggart, Pennsylvania	Grade Angus	Junior Yearling	1168	69.78	4	30
1919	Wanbeek	Iowa State College	Aberdeen-Angus	Senior Yearling	1195	61.20	1	50
1920	Major	C. L. Taggart, Pennsylvania	Aberdeen-Angus	Senior Yearling	1170	66.41	3	44
1921	Bamboo II	Iowa State College	Aberdeen-Angus	Senior Yearling	1270	70.00	3	23
1922	Yankee Pride	C. L. Taggart, Pennsylvania	Grade Angus	Junior Yearling	980	65.92	Champ.	65
1923	Prospect	Iowa State College	Aberdeen-Angus	Senior Yearling	1475	64.75	5	18
1924	Quaker L. 2nd	University of Minnesota	Aberdeen-Angus	Junior Yearling	1035	64.36	3	21
1925	Pony	Iowa State College	Aberdeen-Angus	Senior Yearling	1380	63.11	5	40
1926	Mellow Boy	C. L. Taggart, Pennsylvania	Grade Angus	Summer Yearling	860	63.58	None	22
1927	Antler C. B. 10th	Iowa State College	Aberdeen-Angus	Junior Yearling	1263	65.87	None	25
1928	Benny	Keith Collins, Iowa	Grade Angus	Junior Yearling	1163	62.24	Champ.	$8.75
1929	Briarcliff Black Dan	Briarcliff Farms, Inc., N. Y.	Aberdeen-Angus	Summer Yearling	1110	63.34	None	20
1930	Briarcliff Lightning	Briarcliff Farms, Inc., N. Y.	Aberdeen-Angus	Summer Yearling	965	63.94	None	22
1931	Energy of Woodcote 2nd	Woodcote Stock Farm, Mich.	Aberdeen-Angus	Junior Yearling	1025	63.80	None	19
1932	Tom	Harold Brown, Illinois	Aberdeen-Angus	Junior Yearling	1165	61.29	1	17
1933		Anna Fassett, Illinois	Aberdeen-Angus	Summer Yearling	984	62.91	None	Not Sold
1934	Meadow View Pride 2nd	Raymond Mobley, Illinois	Aberdeen-Angus	Summer Yearling	1000	64.40	Champ.	32
1935	Chocolate King	Mario Krejci, Illinois	Aberdeen-Angus	Summer Yearling	974	64.07	2	25
1936	Black Tom	Harold Tyner, Indiana	Aberdeen-Angus	Senior Yearling	1015	64.63	1	25
1937		Lawrence Morgan, Illinois	Aberdeen-Angus		920	67.71	7	21
1938		Mardelle Paustain, Iowa	Aberdeen-Angus		888	62.93	1	30
1939		Ralph Hanes, Illinois	Aberdeen-Angus		1050	64.56	8	16
1940	Duke	Glenn Lodge, Illinois	Aberdeen-Angus	Summer Yearling	1050	67.71	None	21
1941	Ajax	Harold Tyner, Indiana	Aberdeen-Angus		957	65.23	9	23 1/4

[1]Note: No shows in 1914 and 1915.
*Courtesy, International Livestock Exposition, Chicago, Illinois.

Champion Lamb or Wether Carcasses (International).

Year	Owner	Breed	Age	Live Wt.	Dressing Pct	Price
1906	University of Wisconsin	Southdown	Lamb	118	51 21	25
1907	University of Wisconsin	Southdown	Lamb	97	50 52	50
1908	University of Wisconsin	Southdown	Lamb	96	57 29	50
1909	University of Wisconsin	Southdown	Lamb	94	60 64	51
1910	Wm. Cooper & Nephews	Southdown	Yearling	100	58 80	.12
1911	University of Wisconsin	Southdown	Lamb	105	55 21	41
1912	University of Wisconsin	Southdown	Lamb	78	55 3	60
1913	University of Wisconsin	Southdown	Yearling	142	62 68	.16
1916	Heart's Delight Farm, N Y	Southdown	Lamb	90	55 55	60
1917	Heart's Delight Farm, N Y	Southdown	Lamb	82	57 30	.77½
1918	Heart's Delight Farm N Y	Southdown	Lamb	82	57 32	.62
1919	Heart's Delight Farm, N Y	Grade Southdown	Lamb	108	55 56	76
1920	Pennsylvania State College	Grade Southdown	Lamb	94	51 30	1 60
1921	University of Wisconsin	Grade Southdown	Lamb	98	53 06	71
1922	Pennsylvania State College	Grade Southdown	Lamb	89	58 43	1 25
1923	Alice Clarke Wisconsin	Grade Shropshire	Lamb	113	52 65	1 00
1924	University of Wisconsin	Southdown	Lamb	112	53 57	29
1925	University of Wisconsin	Southdown	Lamb	92	57 61	8 00
1926	Iowa State College	Southdown	Yearling	111	51 05	90
1927	University of Wisconsin	Grade Southdown	Lamb	97	54 64	3 00
1928	John D Larkin, Inc	Southdown	Lamb	98	52 04	3 00
1929	Walter J Templeton	Grade Southdown	Lamb	91	50 55	75
1930	University of Wisconsin	Grade Shropshire	Lamb	93	50 54	2 00
1931	Pennsylvania State College	Southdown	Lamb	91	56 01	60
1932	Helms Brothers Illinois	Southdown	Lamb	78	55 13	1 55
1933	Pennsylvania State College	Southdown	Lamb	77	50 66	25
1934	John D Larkin, Inc.	Southdown	Lamb	90	54 44	30
1935	Helms Bros.	Southdown	Lamb	95	51 74	1 50
1936	Helms Bros.	Southdown	Lamb	88	54 55	2 00
1937	Henry Amsler	Shropshire	Lamb	84	53 57	68
1938	Roy Helms	Southdown	Lamb	75	54 67	50
1939	Henning Bros	Southdown	Lamb	75	57 33	65
1940	Penn State College	Southdown	Lamb	91	56 01	1 50
1941	Penn State College	Southdown	Lamb	83	54 23	1 00
1942 45	No Award					
1946	Wayne Disch	Southdown	Lamb	105	60 00	1 00
1947	Ben Disch, Evansville Wisconsin	Southdown	Lamb	82	51 90	1 00
1948	Ben Disch and Son	Southdown	Lamb	87	55 17	2 00
1949	University of Illinois	Southdown	Lamb	82	56 20	3 25
1950	D K. McEwen Ontario, Canada	Southdown	Lamb	91	57 00	2 25
1951	University of Wisconsin	Southdown	Lamb	100	59 00	63
1952	Michigan State College	Southdown	Lamb	80	55 00	41
1953	Purdue University	Southdown	Lamb	105	58 1	3 00
1954	Purdue University	Southdown	Lamb	88	56 5	2 00
1955	Purdue University	Southdown	Lamb	84	59 5	2 60
1956	Purdue University	Southdown	Lamb	100	60	13 00
1957	University of Kentucky	Southdown	Lamb	90	58 9	27 00
1958	University of Wyoming	Southdown	Lamb	85	56 47	30 00
1959	Robt. Outhouse, Lafayette, Indiana	Southdown	Lamb	85	55	32 00

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Live Stock Population by Countries.

Countries	Cattle	Hogs	Sheep
Canada	9,843,000	5,550,000	1,141,000
Mexico	16,700,000	8,220,000	5,380,000
United States	101,520,000	58,464,000	33,621,000
Argentina	45,406,000	3,858,000	48,711,000
Bolivia	2,260,000	—	6,464,000
Brazil	64,000,000	36,606,000	22,000,000
Chile	2,560,000	733,000	5,784,000
Ecuador	1,216,000	683,000	1,502,000
Paraguay	4,336,000	—	193,000
Peru	3,100,000	1,341,000	14,396,000
Uruguay	7,305,000	26,0000	26,000,000
Venezuela	6,200,000	—	—
Cuba	4,550,000	1,440,000	210,000
Dominican Republic	860,000	1,100,000	—
El Salvador	985,000	325,000	—
Guatemala	1,218,000	394,000	840,000
Honduras	1,175,000	525,000	—
Nicaragua	1,044,000	235,000	—
Australia	17,170,000	1,220,000	149,000,000
New Zealand	5,600,000	695,000	46,026,000
United Kingdom	10,916,000	5,516,000	20,466,000
Union of South Africa	11,604,000	1,275,000	40,000,000
U. S. S. R.	70,400,000	56,400,000	129,600,000
Japan	3,480,000	1,510,000	1,020,000
Philippine Republic	4,262,000	6,208,000	—
France	17,792,000	7,728,000	8,743,000
Germany, West	11,815,000	14,386,000	1,107,000
Italy	9,300,000	3,746,000	8,507,000
Spain	3,184,000	6,050,000	24,115,000
Belgium	2,298,000	1,411,000	107,000
Denmark	3,113,000	4,777,000	36,000
Finland	1,827,000	435,000	407,000
Austria	2,323,000	2,728,000	194,000
Yugoslavia	4,997,000	3,852,000	11,211,000

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